

Review on Web Service Architectures and Service Oriented Architecture Modelling Techniques for Monitoring Scholarly Publication Performance

Ummu Hani' Hair Zaki¹. Roliana Ibrahim²

Author(s) Contact Details:

^{1,2} Faculty of Computing, Universiti Teknologi Malaysia, 81310, Skudai, Johor Bahru, Malaysia

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Abstract An academician in a university will be assessed according to their performance metrics that consists of based on teaching performance, research performance and supervision performance. It is essential for academician to actively engage in scholarly publication activities. Admittedly, scholarly publication is a competitive and critical phase for any researchers. But, not all of them are capable to achieve scholarly publication target metrics. This scenario somehow affects their target metrics for particular year. The basis of this study is to unveil the challenges in achieving scholarly publication target among academician and to recommend a web service based solution. This study discusses the application of existing web service architecture in monitoring scholarly publication performance and highlights current Service Oriented Architecture (SOA) methodologies.

Keywords: Web Service, Service Oriented Architecture and Scholarly Publication.

1. INTRODUCTION

The main objective of Higher Education Institutions (HEIs) in Malaysia is to become the world class university. Breakwell and Tytherleigh (2010) added that in HEIs, Key Performance Indicators (KPIs) is symbolized as a huge agenda in enhancing the university performance. Many programs were launched in order to encourage public universities to be the world top universities. A study by Sharanjit Kaur Dhillon et al. (2013) described that UTM is developing a performance measuring scheme called *Key Amal Indikator* (KAI). It is developed with suitable targets as a measurement system. In "Key Amal Indikator" 2011, it serves as real tools in monitoring university goal and outcome of the strategic scheme implementation.

According to Masron et al. (2012), the academicians in a university will be assessed according to their KPIs that consist of based on teaching performance, research performance and supervision performance. In any research universities around the world particularly in UTM, writing academic publications is the principal indicator of great achievement. S. K. Dhillon et al. (2015a) added that academic publication aspect is evaluated for reasons of advancement and to gain research grants from the government or organization. Additionally, S. K. Dhillon et al. (2015b) claimed that academic publication not only about formation of new idea but also enhancing the academic staff quality and increase the institution in term of economy and reputation.

But, not all graduate students are capable to produce scholarly publication within university target, even academicians also cannot achieve publication target set by the university. Indeed, scholarly publication is a competitive and critical phase for graduate students and researchers. For academicians who are having administrative duties, it is a great pressure to them in order to start writing due to time constraint. The stagnant in writing academic publication is caused by the quality attitude of researcher themselves whose not plan their research publications. Plus, identify a suitable journal to be published on is a tiresome task.

The status of journal quartile or impact factor (IF) of publication and citations are available but not all academicians have it in hand. For new graduate faculty academician, getting research student to be supervised is not easy. They need to apply research grant which is not easily endorsed. Furthermore, the verification of journal publication takes long waiting time. To face the challenge of competition, a strategic monitoring tool is needed by incorporating related service into an application.

Those mentioned issues above can be enhanced by applying web service architecture. John B. Oladosu et al. (2009) defined a web service is any piece of software that makes itself available over the internet which enables the application integration becomes much more flexible because a web services permits the revealing of current system role so that different system can utilize the role of the program. Hence, this study addresses the need for monitoring the unreachable target in scholarly publications by academicians.

2. SCHOLARLY PUBLICATION

S. K. Dhillon et al. (2015a; Pierce (2013)) stated that scholarly publication acts as the primary criteria of evaluation in the academic arena. Due to that, graduate students and research scholars are compulsory to practice an active scholarly engagement in their relevant fields. Rickarda et al. (2008) believed that publishing academic writing is the main indicator of success at research-intensive universities and an important dimension of individual and institutional performance.

As this subject matter, Sharanjit Kaur Dhillon et al. (2013) explained that UTM is applying the KPI deliverable as one of the significant way to increase the whole performance of academicians headed for attaining the university strategic goals. To take the effort, a set of strategic objectives is developed by "UTM'S STRATEGIC PLAN: Mission, Vision and Aspiration" (2010). It illustrates the important of scholarly publication & citation metric in order to be a world class centre of academic and technological excellence.

Scholarly publication is the written papers that undergo peer reviews for ensuring the paper will be published in a specific journal. Besides, Yazit and Zainab (2007) added that other tangible output of scholarly publication are thesis, academic dissertations, book chapters, and conference papers. On the other hand, citation is a declaration of referencing specific opinions by authors. It gives recognition to other writers and also offers researchers with extra evidence about the particular topic. Amongst the status and standard measurement of a journal is known as Impact Factor (IF). Citation and IF is inseparable.

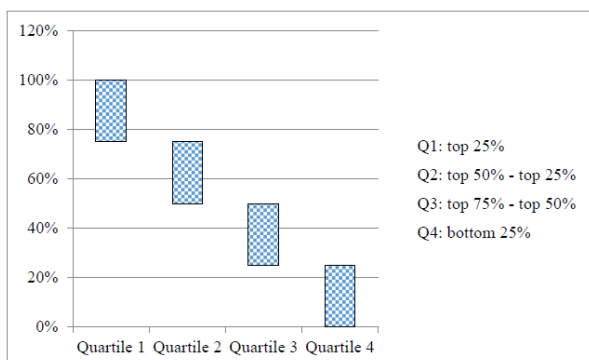


Figure 1: Quartile ranking

Reuters (1994) defined an IF as a measure of the average of article in a particular journal that already been cited in a specific year. Eugene Garfield is the one who formulated IF as claimed by Mishra (2009). Usually, a list of journals is arranged from uppermost to lowermost IF. The list is equally divided into four parts. Every part is called quartile or quarter. The quartile is tabulated in Figure 1. The related quartile is known as Quartile 1 (Q1), Quartile 2 (Q2), Quartile 3 (Q3) and Quartile 4 (Q4). Journal with the maximum IF is categorized into the top quartile which is Q1 Riera (2014). S. K. Dhillon et al. (2015b) admitted that Q1 journal is an indicator of international acknowledgement.

3. LITERATURE REVIEW

There is a style for software architectural that using service as the core structure element named Service Oriented Architecture as identified by Ameller et al. (2015). As summarized by Barry and Dick (2013), SOA is essentially a collection of services. Hustad and de Lange (2014) claimed that SOA signifies group of services used to increase the competency of organizations to run business, support the development of fast, small-price and straightforward configuration of distributed applications even though in large scenarios as referred to Auer et al. (2011). Thus, Abe et al. (2007) performed a study and found out that handling SOA is an important job for an enterprise. These days, Ali et al. (2010) identified that the SOA is blooming as an encouraging architectural styles.

The idea of SOA is highlighting the reusability, abstraction, loose coupling, statelessness, compos-ability, scalability, flexibility and discoverability as emphasized by Ameller et al. (2015; Abe et al. (2007); Bertram & Kleiner (2012; El-Gayar & Deokar (2013). Look deeper into loose coupling term; Liu et al. (2008) found out that it is a condition where software and hardware might work together but not rely on each other to be functioned. By chance, web services are software application that uses loose coupling.

El-Gayar and Deokar (2013) analysed that services are autonomous building blocks that in cooperate to deliver application functionality. Ameller et al. (2015); Idoughi et al. (2010) support by saying that services are software modules in a web system that could be installed thus accessible in numerous networks. Besides, services also helps in making user requirements accessible by means of autonomous services available in a standardized form. Barry and Dick (2013) claimed that services are what you can connect together using Web Services. Hu and Zhang (2014) added that web service is a design philosophy to realize SOA. The integration of services throughout the organization will make up a SOA as described by Barry and Dick (2013).

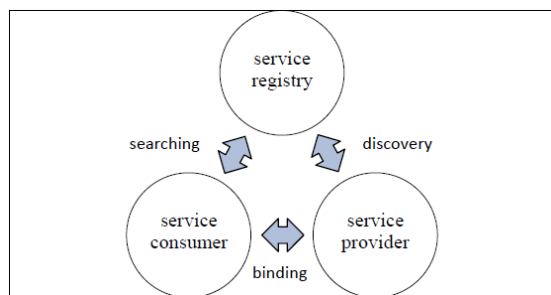


Figure 2: Architecture of SOA

As illustrated in Figure 2, the main elements of web service can be described as service registry, service consumer and service provider. Hu & Zhang (2014; Crasso et al. (2014)) described service consumer searches the service registry to discover a service that they require while service consumer binds the web service by service provider. In addition, service provider generates a web service thus broadcasts its interface.

As testified by manasa (2011), an Application Programming Interface (APIs) and web service are sort of a communication. An API defines the functions for a software program to interact with the other. An API performs as an interface between two dissimilar applications so that they can interconnect with one another. Every web services are APIs but all APIs are not web service. This is because the web service enables communication between two machines throughout a network. Therefore, to deliver stakeholders with fast and effective approach, Idoughi et al. (2010) believes that SOA with its essential web service compromise such favorable method to be used in the formation of fresh stakeholder collaboration models inside multifaceted association.

3.1 Related Study of Web Service Architecture for Monitoring Scholarly Publication

In this section will discuss about the existing web service for scholarly resources in monitoring scholarly publication performance. Based on Table 1, the ScienceDirect APIs access is granted to clients based on subscription as highlighted in Elsevier (2015a). As for Scopus APIs, Elsevier (2015b) mentioned that the access is limited for client without Scopus subscription while Springer (2015) claimed that Springer APIs is limited data extraction depends on host institution's subscription. IEEE (2015) grants the IEEE Xplore Search API to allow the search query term can only contain a maximum of 10 words.

Moreover Reuters (2015) addressed that the extractable data in Web of Science web service is limited to particular fields, datasets, and field paths, also depends on host institution's subscription. Last but not least, the journal ranking online database named SCImago Journal Rank is another important publication source for researchers to identify the journal quartile. The data

source of SJR is from Scopus and it provides web service XML for developer to integrate their information into the developed system.

Table 1: Existing web service for scholarly resources

| Author(s) | Summary of Features |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Elsevier (2015b) | ScienceDirect APIs expose peer-reviewed scholarly publication information from journal indexed by Elsevier and ScienceDirect platform. |
| Elsevier (2015a) | Scopus APIs represents a free citation and abstracts from all scholarly journals indexed by Scopus and Elsevier. |
| Springer (2015) | Springer APIs exposes content for open access articles from SpringerOpen and BioMed Central journals. |
| IEEE (2015) | IEEE Xplore Search API grants users to search the content repository and retrieve results for manipulation and presentation on local web interfaces. |
| Reuters (2015) | Web of Science web service acts as bibliographic search service. It grants a real time and automatic searching of records. |
| González-Pereira et al. (2010; SCImago (2007) | SJR data source is utilized from Scopus due to the best overall structure of world science globally. Scopus also is the world's largest scientific database during 2000 – 2009. It covers almost journals in the Web of Science (WoS). |

3.2 Related Study of Service Oriented Architecture Modelling Techniques

Generally, extended enterprises, virtual organization and e-business are the type of networked enterprise that operated based on associate of organizations in Li et al. (2009). Due to fast and vigorous changes in such atmosphere, the information system faced a huge amount of information exchange that involves interoperability in many levels. Conventionally, a company will serve a new system for any particular requirement. This attitude was expensive and hard to be modified as the company keep evolves. Therefore, Xu (2011) believed that the integration of information system is arise to produce a flexibility for real-time data exchange, real-time visibility, real-time responsiveness and real-time collaboration across the information systems.

The interoperability and integration functionality is addressable by SOA seamlessly as it is a rapid emerging example in information technology to upgrade agility and flexibility due to web technology. Yet, in Erl (2005), the interoperability of service in SOA is not limited only to web services but web services are the most appropriate technology for a fruitful SOA. To control and manage information system based on SOA,

the source of information and function of business can be transformed to segmental service unit that usually shared across the information system. Zhang et al. (2006) highlighted the purpose of supporting service-oriented system development the information system based on SOA must be defined at high level of abstraction regardless of implementation details.

Table 2: Existing service oriented architecture modelling techniques

| Author(s) | Summary of Features |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mohammadi and Mukhtar (2013); OASIS (2012) | SOA-RM delivers a simple language for comprehend the crucial characteristic of SOA. SOA-RM defines the vital ideas and connections in the domain concentrating on what differentiate the fundamental of the domain. |
| Corporation (2008) | SOMF is a model driven methodology for software development that offer strategic and deliberate resolutions to enterprise problems that have been permitted by Sparx Enterprise Architect. |
| OASIS (2012) | SOA-RAF is ultimately focusing on wide range of dispersed system. The users of systems were legally isolated entities. So it is possible for SOA-RAF to be implemented in different platforms. The SOA-RAF looks the SOA as a system that has capability to develop in order to achieve requirement. It also assume SOA as an ecosystem consists of processes, machine and people operate together to provide those capabilities as service. |
| Arsanjani et al. (2008) | SOMA methodology is a software development lifecycle technique that produced and initially recognized by IBM in 2004 to design and build SOA based solutions. It is broadly used in various industries with more detailed in letting the practitioners systematically toward a collection of SOA solution. |

According to Table 2, SOA-RM is an early body of work on the SOA reference architecture. It is used to understand the essence of SOA and core concept. However, SOA-RM could not support the service identification and service composition. It also does not take care issues regarding using, constructing and owning a SOA based system. SOMF offers strategic and deliberate resolutions to enterprise problems. Additionally, SOMF pattern and symbolization is

approved by Sparx Enterprise Architect modelling platform. This allows analysts, executives, developers and architects to follow the principal SOMF life cycle disciplines. Even though SOMF constructed models such as design, analysis and architecture but it doesn't support transformation of existing assets to SOA.

Next, SOA-RAF comes from the ideas and relations explained in SOA -RM. The aim of the SOA-RAF is on incorporating business with the IT. In contrast, SOA-RAF does not encounter the service identification but still enough in a specific source for SOA-based system. Besides, in SOMA, the most focuses are service model and reusing of services. It is widely used in industry and business area. SOMA has flexibility because there are different approaches for SOA migration depending on the decision made: to create custom software, to use legacy applications or to integrate package applications as admitted by Wijayanto & Suhardi (2014). Yet, SOMA is a proprietary methodology of IBM, Svanidzaitè (2012) addressed that it full specification is not available. SOMA as introduced by Arsanjani et al. (2008) is intentionally to help in developing a changeable scope's type of projects in numerous industries. He also claimed that the best practice of software engineering is about the service production and service modelling. The SOMA method covers all SOA design.

4. CONCLUSION

As we mentioned in Section 1 that identifying a suitable journal to be published on is a tiresome task. Besides, the status of journal quartile or high impact publication and citations are available but not all academicians have it in hand. The most important features of the aforementioned SOA modelling methods are summarized in Table 1 and Table 2. This analysis will assist in identification of the potential service that may be used monitoring for scholarly publication performance.

Regarding the findings in Table 1, it can be concluded that Elsevier Scopus APIs and Web of Science web service are suitable in overcoming that issues. This is because Elsevier Scopus APIs consists of serial title API that returns metadata about serial title, including journal metrics of SJR and SNIP. And Web of Science web service offers the IF trend for particular journal title. Therefore, students and academic staffs are able to get a good quartile journals or high impact publications and citations information.

SOA-RM is an early SOA reference architecture and it only concentrates on the lower level with abstract modelling analysis to SOA. SOA-RM could not cover the implementation issues such as authentication, identification and service composition. It also does not take care issues regarding using, constructing and owning a SOA based system. Furthermore, SOA-RAF does not encounter the service identification but still enough in a specific source for SOA-based system. As for SOMF, its

constructed several models such as design, analysis and architecture but it does not maintain the renovation of current resources to SOA.

SOMA was introduced to influence variety of system development methodology in the new SOAs. Changing system to SOA would not be practical if there were no way to access and use the previous applications and technologies. The main aims of SOA are to integrate existing system and provide access to legacy data. The use of Web Services can be a perfect way to bridge the present systems with each other and with new technologies. This means that the integration is faster and easier. It split the business process of existing application and classified the candidate services to recognize business goals in the new architecture. Additionally, SOMA also recognizes potential domain problem and domain focus where different services required to be established from an external provider as mentioned in IBM (2004).

In SOMA methods, the most focuses are service model and reusing of services. This method is widely used in multiple industries. Furthermore, Mohammadi and Mukhtar (2013) added that SOMA is more perspective and detailed in allowing the practitioners in a systematic way toward a set of SOA solution. It is vital to know that SOMA phases are not sequential. They are relevant in an iterative, risk-driven and incremental approach using a nuance peculiar to the SOA life cycle Arsanjani et al. (2008). Risk-driven is about monitoring the developers to use a minimal set of architecture technique to reduce their most pressing risks in Fairbanks (2010)). Therefore, in this research project, it is focusing on identification, specification, realization and implementation and deployment phases as illustrated in Figure 3.

Based on the review of the existing literature, it may be appropriate to suggest that the most suitable service oriented architecture modelling technique for developing web service based architecture for scholarly publication is SOMA in term of service model and reusing of services. And the most suitable web service API is Elsevier Scopus APIs named serial title API. The purpose of this article was to prepare a way for increased knowledge about web service and existing service oriented architecture modelling techniques, so then the web service can be of great benefit by providing solution to monitor scholarly publication.

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AUTHOR PROFILES:

Ummu Hani' Hair Zaki has a Diploma in Computer Science (Information Technology) and a Bachelor of Computer Science (Software Engineering) at Universiti Teknologi Malaysia. Currently, she is a master student of Computer Science in Faculty of Computing at Universiti Teknologi Malaysia.

Roliana Ibrahim is a senior lecturer in Department of Information Systems, Faculty of Computing, Universiti Teknologi Malaysia (UTM). Back in 1994, she received her Higher National Diploma in Computing, Computer and Mathematical Sciences School at Liverpool John

Moore's University, United Kingdom. After that, in 1998 she received her Bachelor of Science (Hons) in Computer Studies at the same school in 1994. In 2001, she was granted with Master of Science (M.Sc.) in Computer Science in Department of Information Systems at UTM. Finally, in 2008 she got her Doctor of Philosophy (Ph.D) in Systems Science, Department of Information Science from Loughborough University. Currently, she is the Head of Department in Information System Department, Faculty of Computing, UTM.