DATA MANAGEMENT FRAMEWORK IMPLEMENTATION FOR FINANCIAL SERVICE AUTHORITIES (FSA): CASE STUDY IN ASIA PACIFIC REGION

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ABSTRACT

The digital economy is transforming financial service industry, raising critical question for regulatory and supervisory authorities about the appropriate process, tools, and infrastructure to manage the explosion of data . Unfortunately, data governance is a new field in which guidance is limited and practical implementations among organizations are vary wildly due to various interpretation. While substantive practical progress has been made on how regulatory and supervisory agencies manage and govern their data, there is still a lack of academic literature that pivot towards the characteristics of resilient architecture of data management, particularly in financial regulatory & supervisory environment. Using the research method of benchmarking, this study analyses exemplary data management cases in four Asia Pacific's financial supervisory agencies (FSA), to articulate resilient concepts and strategies that foster effective architecture of data management. Proprietary eighteen items of comparison are used to benchmarked data management and governance implementation in each FSA. Results of analysis yield three common underlying characteristics that define effective data management architecture for financial regulatory agencies. These characteristics can provide significant direction and be used as foundations in designing resilient and practical integrated data management architecture. Furthermore, the eighteen items of comparison formulated for this study can be utilized by other organizations wishing to conduct benchmarking study to extract the characteristics of data management and governance operations.

Keywords: *Data Management Architecture, Data Governance, Financial Regulators, Benchmarking*

1. INTRODUCTION

The financial industry is in the midst of big disruptions. Many locations around the globe has witnessed explosive growth of FinTech innovations [1] that can provide boundless potential in the context of financial and social inclusion[2]. This FinTech firms are thriving thanks to the emergence of multiple advances in technology, such as the increase availability and affordability of tech infrastructure (internet, sensors, smartphones), the maturing technology (machine learning, big data), and new business operations (sharing economy)[3].

The wave of FinTech disruption not only change the industry landscape but also swept the established players. They, too, are forced to quickly reinvent their business by implementing technology-based innovation to avoid being marginalized by the competition. With so many of economic and financial interactions are now taken place in digital ecosystems, more data are being generated than ever before. This results in the shift of financial institutions' operational structures and business models, that place data at the very core of both [4].

It goes without saying that the newly focused approaches that emphasize the utilization of technology bring significant impact on financial

supervision [5]. Many of these new innovations are characterized by the use of large amount and new type of data that generate inherent risk to some dimensions of the financial supervision and regulatory, such as customer protection and financial system stability. In addition, they also bring a new type of risk: the regulatory risk. With the emergence of unconventional business model powered by online innovations, a one-size-fit all regulatory framework is no longer adequate [6].

Regulators must work diligently and thoughtfully to protect customer and to maintain stability without inhibiting the innovations [7]. To accommodate the risks and opportunities posed by data-driven industry, financial regulatory agencies need a new approach, particularly in the area of data governance and management. This is an exciting new area since a lot of organizations in various industries is marching toward the implementation of integrated data management architecture, while the guidance and academic literature are still in infancy.

Recognizing this gap, this study tries to provide compact data governance guidance for financial supervisory agencies (FSA) by finding common characteristics that make up a robust data management practices. The research to identify the characteristics was being done by benchmarking the data management practices in four different financial regulatory agencies. It is hoped that by analyzing relevant item of comparisons that become the backbone of data governance and management architecture, key commonalities that enabling FSA to regulate the industry more effectively can be found.

2. THEORITICAL FOUNDATION

2.1 Importance of Data Management

The basic concept of data management is that data is an organizational assets and needs to be managed appropriately [17]. Nowadays, business and IT executives are increasingly agree that data is a valuable resources. This view has grown so prevalent and lead to recognition of data management as a "must have" capabilities among organizations [18], particularly those dealing with large amount of data as the backbone of their operations. Furthermore, decision making process in organization continue to relies more on data [19] and the confidence in making the right decisions is usually characterized by the quality of data being

used. Therefore, effective data management must not only be able to empower organizations in capturing structured and unstructured data, but also ensuring data quality [16].

Data management is a discipline that involves people, processes, and technology [20], hence, organizations must adopt holistic approach in implementing data management. This will ensure organizations can continuously quantify the quality of their data. Data quality is not an issue that can be taken lightly. A past study by Newman [21] has revealed that most organizations, despite fully aware that "data is the new oil", still employ management of information that less focused and less disciplined. It usually characterized by: integration projects that are redundant, costly, and resource hungry, information sources that are not rationalized, and rigid system design that impossible to cater changing business needs. In addition, current data management landscape is often siloed and unable to establish link between big data world and enterprise data, causing difficulties in deriving the benefits of data-driven analytics [23]. These problems can be attributed partly to the fact that data governance and data management is an emerging topic, as highlighted by a more recent research also conducted by Newman [22]. Thus, further research and development, especially in the area of effective data management architecture, is needed.

2.2 Data Management in Financial Supervisory Agency

Financial supervision to ensure financial stability is a function vastly driven by data. Since the last financial crisis, policy makers and supervisory agencies have step up their effort to standardize data regulatory to ensure that gaps in data is addressed [5]. This efforts exposed the need for high quality data that is comparable and timely across global financial network [24]. Despite the need is apparent, recent research has showed that the FSA involvement in utilizing comprehensive data management architecture (including big data platform) is still limited [25]. However, there is a worth looking trend that recently show rising numbers of Central Banks and FSA that rethinking their legacy data infrastructure by appointing chief data officer and setup dedicated data management team [24] [25].

In the area of central banks and financial supervisory agencies, big data technology has been

dubbed as the tools that can offer a wide range of applications such as forecasting, modeling, and early warning system. With the emergence of FinTech phenomenon, financial supervisory agencies (FSA) tasks are getting more complex than before. "Tsunami of data" resulted by the shift of industry landscape has change the structure of economy and could potentially impact important metrics such as financial and monetary stability [26].To deal with this, work on data management and big data project have been considered as mainstream activity for central banks and FSA, as revealed by recent survey conducted by Central Banking and BearingPoint [27]. Despite this, authority agencies still tend to focus more on software and hardware, and less on human resources and security, exhibiting a lack of clear structure approach.

In light of the recent development described above, it is apparent that data management and governance, specifically in FSA, remain a work in progress. Practitioners continuously looking for best practices in this emerging intersection area of data and technology. This study is expected to be able to enrich the literature and overcoming the challenged faced by FSA in implementing effective data management architecture.

3. METHODOLOGY

3.1 Benchmarking

Benchmarking is one of the oldest management tools aimed to systematically search for best practice in a certain area [8]. American Productivity & Quality Center (APQC), a global organization that set the best practice in benchmarking, pointed that "benchmarking is the process of comparing and measuring one organization against others, anywhere in the world, to gain insights into measures, performance, and practices in a way that can rapidly improve the journey to world class performance" [13]. In another words, benchmarking is an industry term that refer to comparison of business processes and performance metrics of one organization to the others for the purpose of improvements. Benchmarking is a challenging process [9] and has been used in a wide variety of firms coming from diverse sector including education, construction, aviation, manufacturing, banking, financial services, pharmaceuticals, and governments/public sectors [10][11]. Specifically for government/public sector agencies, earlier report by Auluck [12] has confirmed that benchmarking-as

a tool to facilitate organizational learning-can improve organization performance.

The ultimate goal of benchmarking is to find out the best practices and extract any characteristics from them that feasible to be implemented. That is the main reason why this study choose benchmarking method, which is to identify the characteristics of effective integrated data management architecture among financial regulatory agencies.

3.2 Benchmarking Target Selection

The benchmarking targets in this study involve 4 (four) different FSA namely FSA1, FSA2, FSA3, and FSA4. The explanations for each are as follows.

1. FSA1. A supervisory agency and prudential regulator in a developed country with GDP close to $1.5 trillion (data as of 2018). The agency oversee various industries such as banking, credit unions, and insurance. The total asset of the industries that it supervises reach $6 trillion in 2017.

2. FSA2. A central bank and financial regulatory authority of a country with GDP around $350 billion (2018). Its mandates is to foster progressive and sustainable economy via appropriate policy and surveillance tools. The economy of country where FSA2 operating is a vibrant and highly developed one with almost 1700 registered financial institutions.

3. FSA3. A supervisory authority with principal tasks of conducting supervision and enforcement activities in financial institutions and capital market in order to ensure consumer protections. It has a very demanding role since the country that it resides is one of the biggest economy in Asia with more than $1.5 trillion of GDP in 2018.

4. FSA4. A public agency that regulate and supervise banks, capital market, and financial institutions in a country with $1 trillion of GDP. The country's economy is an emerging one and poised to grow larger in decades to come. FSA4, thus, facing significance challenge in the future in supervising fast growing number of financial institutions.

3.3 Benchmarking Method

This study employs APQC's benchmarking method that has been recognized as the leading methodology owing to its flexibility and robust

results [13]. The method consists of four phases as illustrated in Figure 1.

Figure 1. APQC's Benchmarking Methodology Phases

To identify the common characteristics that underlie robust data management architecture among the financial supervisory organizations investigated in this study, 18 (eighteen) items of comparison are proprietarily formulated. These items of comparison are derived based on thorough review of international standards of data and information management frameworks, the Data Management Framework 2.0 (DAMA-DMBOK2). This item of comparison is then used as a guidance to collect and analyze information in order to interpret the characteristics of data management architecture in each FSA.

The 18 (eighteen) items of comparison, including the explanations for each, are as follows:

Table 1: Items of Comparison.

No	Item of Comparison	Description
1	General Approach	The approach carried out by each FSA in managing their data and information
2	Frameworks	Frameworks utilized as reference in data management
3	Organization Structure	The structure of data governance and management team in each FSA
4	Roles & Responsibilities	Explanations of roles and responsibilities of team/division involved in data and information management
5	Types of Policies, Procedures, and Processes	Explanations of policies, procedures, and processes in data governance context
6	Governance Process	Real approach of governance process in each FSA
7	Data Architecture	The availability and implementation of data architecture in data management process
8	Data Model	The availability and

No	Item of Comparison	Description
		implementation of single and integrated data model
9	Metadata Management	Experience regarding metadata management in each FSA
10	Data Storage	The availability and standard implementation of data storage
11	Data Security	Strategy, approach, and implementation of data security in each FSA
12	Data Consolidation	Information regarding approach, methodology, technique, and challenges related to data consolidation process
13	Data Sharing	Methods and techniques utilized for data sharing between agencies
14	Unstructured Data Management	Strategy, methods, and techniques utilized for managing unstructured data
15	Master Data & Reference	Experience and condition related to Master Data and Data Reference Management in each FSA
16	EDW, Big Data, & BI Experience	Technology used in EDW & BI System. Experience in Big Data Technology
17	Data Quality Management	Holistic approach in terms of policies, methods, processes, and technology used to ensure data quality
18	Integrated Reporting	Reporting approach utilized in each FSA

4. RESULTS AND DISCUSSIONS

The general results obtained from the research have shown that FSA are becoming more IT-centric in recent days, regardles the size of industry they oversee. Common data management supporting elements such as executive dashboard, data warehouse, master data and metada repository have been the must-have tools among the FSA. This finding is aligned with previous study, which conlude that "data is an asset" [17], thus, data management is a "must-have capabilities [18], and increasing work on data mangement is prevalent among FSA all around the world [27].

Nevertheless, it is still apparent that there are many areas that can be improved particularly on the FSA's understanding toward the need of integrated data management architecture. This conformed the view of previous reports that mentioned the infancy stage of data governance understanding among organizations [23] [25].

Furthermore, a thorough discussion on the findings of the research on each FSA is outlined as follows.

4.1 FSA 1

Based on the 18 items of comparison captured in FSA1, it was found that the agency have a centralized data management team, consist of the representative from business and technical people. This data management organization works according to the framework laid out by Data Management Body of Knowledge (DAMA-DMBOK2), a well-known and comprehensive guidance written by a team of 120 practitioners. As a result, data management in FSA1 has reached a maturity level where policies, procedures, and governance process are in place already, and all is aligned with DAMA's guidance. FSA1 has also utilized technology in its day to day operation of data management, clearly seen in the utilization of integrated reporting system, data quality management tools, big data, data warehouse, and business intelligence to support analytic activities, and also centralized master data management tool that enables FSA1 to managed more than 200 applications. Nevertheless, there is still challenge in data management aspect in FSA1 mainly in the area of data consolidation. This challenge is coming not from the volume but rather from the complexity of data collected by the agency. Further research is now carried out to address this shortcoming.

4.2 FSA2

Result from FSA2 analysis found that it has applied agile framework in its data and information management operational. The practical translation of this framework is a centralized data management office, led by a Chief Data Officer (CDO). This data management office acts as a business user and consist of several members such as data owner, data administrator, data user, data stewards, and data architect. In carrying out its functions, data management office is assisted by the Information Technology division, implying that technology has become an integral part of data management and governance implementation. Utilization of technology enables FSA2 to maintain robust data management supporting elements such as data storage, data security, BI, big data & data warehouse, data quality automation, and data sharing mechanism. While data consolidation remains a challenge for FSA2, it has develop a clear roadmap toward consolidation of more integrated data architecture capable of handling unstructured data.

4.3 FSA3

Notable benchmarking result from FSA3 is the absence of guiding framework in the development and execution of data governance architecture. Inevitably, formal data governance organization, data management policy, metadata management, and standardized data storage technology are not found within FSA3. Nonetheless, the agency has a centralized data management organization led by the IT division, that possess comprehensive understanding of tools and technology useful in data management. These tools and technology enable FSA3 to maintain sound credit order and fair financial transaction practices via utilization of single integrated application. The agency has yet to be fully ready in managing unstructured data, but has the roadmap in place already. This roadmap includes unstructured data analytics that will accelerate the agency transformation into a more data-driven organization. In a not surprising similarity with other FSA in this study, data consolidation remains mentioned as a significant challenge, with data volume being the main reason.

4.4 FSA4

Despite still in the early stage of data management initiatives implementation, FSA4 has shown considerable progress. It is in the process of transitioning its dispersed data management team into a centralized one, in order to use available resources in a more efficient manner. The agency relies on DAMA as a framework and has identified several quick wins such as executive dashboard, MDM solutions, enterprise wide data-warehouse, and big data lab as initiatives to accelerate their progression toward integrated data management architecture. Data management has become a strategic theme in this agency and an organization-wide discussions to encourage officers in all division to start learning and mastering tools and technology useful for data management has been

kicked off. In spite of the progress, however, this study founds several areas that still needs to be addressed in the journey to become tech-driven supervision agency. The absent of robust data model, ineffective data consolidation policy, and inadequate data sharing method will remain a major hinderance that need to be solved soon.

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Elaboration on each study conducted in 4 (four) different FSA above clearly showed that partial implementation of data management framework (if any) is the norm for this time being. It is understandable since the shift from administrative-centric approach toward more technological utilization is something that cannot be done overnight. Deep understanding of the underlying concept and technology, strong alignment between stakeholders, including the availability of resources, are among the top factors influencing the velocity of implementation.

Based on the factors mentioned earlier, it is apparent that some particular FSA are moving faster than their peers in the implementation of data management framework. For instance, FSA that reside in countries with relatively developed economy are normally more adept in using technology, hence, having more advanced implementation in data management framework. The challenge for these FSA is to maintain their cutting-edge understanding, since technology is a sector that moving at a lightning speed.

On the other hand, FSA in emerging economy in which the financial industry has just started to blossom, will find themselves on the early path of the journey. These FSA will usually compensate the delay start by identifying some quick wins to help kick start the implementation. While starting with the quick wins is a good idea, FSA must never lose sight on the ultimate goal of having comprehensive framework implemented. The challenge for them is to maintain the balance between chasing quick wins and delivering full implementation.

FSA in any type of economy must also never forget that the industry they regulate is moving blazingly fast. Thanks to novel technologies such as blockchain and edge cloud platform, the financial products that not existed 2 years ago, are now being enjoyed by people that do not even have bank account. It is the real challenge, one that FSA should always consider in formulating their data management implementation strategy.

5. CONCLUSIONS AND FUTURE WORK

Recent disruption in the financial service industry has forced regulating agency to equipped themselves with capabilities to regulate more effectively. One of the sought after capability is the data management that requires comprehensive architecture consisted of people, process , and technology. The benchmarking in 4 different FSAs conducted in this study has revealed different environment characteristics, which implies that the data management practice will always be different from one FSA to another. However, there are at least three profound similarities that underlie the data management practice in each FSA.

1. Framework usage. 3 out of 4 FSAs benchmarked in this study utilized framework as a systematic and rigorous guidance in constructing their data management architecture. While FSA3 does not formally use framework, nevertheless, the data management practice conducted there still resembling the architecture laid out in leading data management framework. Framework, such as DAMA, provides useful guidance particularly for those who yet to know where and how to start. FSA3 has sound understanding of tech and tools already, thus, utilization of framework may be less crucial.

2. Centralized data management team. Each FSA saw the importance of having a centralized data management organization. The centralized structure ensures efficient usage of resources, particularly on the people side since professional with data management credentials are currently in high demand. Furthermore, centralized data management also enable holistic view and policy creation that ensure end-to-end data management issues can be tackled

3. Technology support. The data explosion coming digital economy activities implies that manual method is no longer capable to keep up with growing volume of data. All FSA benchmarked utilized various tools and technology in the form of automation, data warehouse, business intelligence, reporting system, and so on. They all understand that deep understanding of powerful method technology is imperative in realizing robust data management architecture. Hence, it is safe to say that the future of financial regulation will be shift

from traditional approach to be more tech-driven. A comprehensive understanding and proficiency of technology is imminent for all regulators.

This study contributes to data management literature by identifying three characteristics of data management practice in FSAs operating in Asia Pacific big economies. Thus, these characteristics can be taken as lesson learned and adapted by any public or private organization in planning their data management and governance journey. This study also employed a novel approach using 18 items of comparison in order to benchmarked and analyzed the data management practices. Other organizations wishing to conduct similar activity can use these items of comparison.

Furthermore, the study concluded that data management framework implementation is a distinctive journey with starting point, strategy, and impact that differ for any FSA. Level of understanding in concept and technology, the strength of alignment between stakeholders, and the availability of resouces, are the core factor that can decide the strategy of implementation journey.

Lastly, while this study has benchmarked and obtain lessons from FSA's implementation of data management framework, it includes only the Asia Pacific region, therefore, characteristics from other regions of the world were not captured. Larger studies involving FSAs from regions such as America, EU, Middle East, and Africa will be needed to capture more complex environment and identify more global characteristics.

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