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DIAGNOSTIC OF INTEGRATED DATA MANAGEMENT FOR FINANCIAL SERVICE REGULATORY AND SUPERVISORY, CASE STUDY: INDONESIA

[1]WIRIANTO WIDJAYA, [2]RENDY DALIMUNTHE, [1]INDRAJANI SUTEDJA, AND [3]ARMAND WAHYUDI HARTONO

[1]Information Systems Department, School of Information Systems, Bina Nusantara University, Jakarta, Indonesia

[2]Independent Researcher, Grand Palace Kemayoran, Jakarta, Indonesia

[3]PT. Bank Central Asia Tbk., Jakarta, Indonesia

E-mail: [1]{wirianto; indrajani}@binus.ac.id, [2]rendy_dalimunthe@live.com, [4]armand_hartono@bca.co.id

ABSTRACT

The progression of the digital revolution has changed the business landscape everywhere, including for Financial Service Industry (FSI). The use of technology improves the overall effectiveness and efficiencies of business operations. Aside from its benefit, the use of technology also introduces new types of risk. This condition forces the FSI regulatory and supervisory agencies or Financial Service Authority (FSA) to find new ways to handle it while harvesting the benefit.

In this context, FSA should effectively use the collected data to monitor and supervise the FSI's health, business conduct, and compliance with regulations. To achieve this objective, FSA should be able to manage the data through its entire cycle. Data management is a complex process in nature. In many cases, organizations need to figure out where to start with the initiatives.

This study aims to identify the main requirements and challenges in Data Management for FSA in the Indonesian context. It uses the Architecture Development Method (ADM) to guide the process and refers to DAMA Framework as the foundation for analysis. The study concludes that FSA needs to develop a data and information strategy, understand the overall data and information requirement, design their enterprise data architecture, and use the proper technology to address various challenges and needs in the data and information management context. The FSI's Integrated Data Management Architecture (IDMA) is required to address these needs. Data Management initiatives are a critical and foundational factor for FSA to successfully promoting stable and sustainable growth of FSI in the ongoing digital revolution era. A similar organization could use the output of this study as a reference to map the current condition of data management and provides essential input for the preparation of organization-wide data management framework implementation.

Keywords: *Diagnostic Study, Data Management, Financial Service Authorities, Indonesia*

1. INTRODUCTION

Digital revolution continuously materializing everywhere, including in FSI Sector [1][2]. It is defined as the third global revolution after Industrial era; start in early 1980; mainly about the improvement change process derived from the use of information, computing, communication, and connectivity technologies [3]. Recently, it introduces the term "Fintech"; the acronym for Financial Technology; which basically mean the use or application of Information Technology to improve financial activities by delivering financial service in the most efficient and effective manner [4][2]. Beyond that, modern data analysis methods also seamlessly integrated into each financial service transaction, allowing them to be more customer oriented and personalized, effective and profitable [5][6]. Fintech also referred as technology enabled financial solutions [7], which has disrupted the Financial Service sector as such that attract traditional Financial Service companies to start moving towards it.

The wave of changes in financial Service looks unstoppable and certain. The changes not only going to benefit to the advancement and growth of the FSI Sector, but also will introduce new type of risks, such as personal data risks and transaction security risk; which should be carefully mitigated. Financial Service Authorities (FSA) as regulatory and supervisory agency of FSI Sector is looking ways to leverage on Fintech to promote and boost the growth of the FSI Sector, whilst at the same time keeping it stable and healthy by ensuring a fair, transparent and good conduct, as well as protecting the interest of its consumers [2].

To response to the earlier explained phenomenon, FSA might need to prepare and employ new set of rules, policies, and procedures to be in line with the changes induce by application of Fintech. FSA will also need to have proper visibility to Fintech operation and business data, to allows prevention of fraud by predicting companies and investor behaviors [8], real time monitoring of financial transaction, management of risks, FSI companies compliance assessment, and detection and identification of infringement. To meet those requirements, FSA needs to prepare and implement a specific management strategy in data and information area that is tailored to cater its specific characteristics.

In Indonesia context, the requirement for FSA to carefully plan and perform data management initiatives is increasingly becoming an urgent requirement. Like many countries around the world, Indonesia also experiences digital revolution in FSI. Fintech Companies are emerging and its number increasing rapidly. In 2018, Indonesian Fintech is expected to growth by 16.3 percent per annum. Indonesian FSA currently oversees various types digitalized financial services such as P2P Lending, Crowdfunding, Digital Banking, Insurtech, Fintech in Capital Markets, Online Financing, data security and consumer protection [9]. In addition to that, Indonesia FSA also perform regulatory and supervision duties over the entire FSI, including Banking, Capital Markets and Non-Banking Sectors [10]. In Indonesia context, data management requirement will be driven by the requirement to regulate and supervise both Fintech companies and traditional financial service companies such as Bank, Insurance, Pension Fund, Financing Companies, etc.

Data management is a complex topic by itself. The organization needs to plan and manage entire data cycles to utilize data for strategic use. It involves different resources and aspects within the organization, including people, technology, and processes. To start with, the organization needs to identify its data requirements and anticipate the main challenges ahead.

This diagnostic study aims to map the critical data and information requirement and identifying main challenges with regards to data management initiatives. It is carried out to answer the following research question: "What are the data and information requirement and main challenges in data and information management area for Financial Service Authority in Indonesia Context". The study will use Architecture Development Methodology (ADM) developed by The Open Group Standard [11] and refer to DAMA-DMBOK2 published by DAMA International [12] to guide the effort. The output of this study served as one of the bases to design an Integrated Data Management Architecture for FSA in Indonesia Context. It also can be used by similar organization as benchmark reference to perform similar diagnostic prior to design any data management related initiatives.

2. THEORITICAL FOUNDATION

The study referred to various foundational theories that serve as a conceptual basis and framework for analysis and diagnostic activities. The theories also guide the researchers to understand the problem systematically.

2.1 Integrated Data Management

Data nowadays is a vital organization asset. It provides insight that can be turn into knowledge when being properly analyzed. It is a basis for innovation, and essential means to achieve strategic goals. To unlock the potential of data as strategic asset, organization need to develop, execute, and supervise various plans, policies, programs and practices to deliver, control, protect and enhance the value of data and information throughout its entire lifecycle [12]. These set of activities called Data Management.

Organization such as FSA could be very complex in term of structure and roles to accommodate wide ranging of differentiated natures and characteristics of functions and duties that need to be carried out. Works and efforts performed by different areas and structure of organizations need to be planned, coordinated, executed, and aligned to achieve organization strategic goals [13]. Integrated Data Management is basically the integration of data management

initiatives that address various characteristics of data and information requirements due to the complex nature of duties and function performed by FSA; which is to regulates, supervises, and protects the consumer's interest of the entire FSI that is comprises of wide variety of financial service types.

2.2 Diagnostic Study

In medical term, diagnostic refers to a systematical effort to clarify the present or absence of certain condition of a patient to develop planning to treat and cured diseases [14]. In universal definition, diagnostic can be interpreted as the process to identify the nature or cause of certain phenomenon. Diagnostic is a mean to explain certain issues and challenges that is needed to be solved.

Study; or in the context of this paper is a research; is a creative and systematic work to obtain knowledge by elaborate certain topic or area of humans, science, culture or society, and seek for the way to use it to devise new application [15]. The diagnostic study described in this paper is a scientific research to gain knowledge and understanding on the Integrated Data Management, in the context of FSA and Indonesia; by elaborating conditions and challenges that are related to it.

2.3 Financial Service Regulatory and Supervisory

Financial Service Authority (FSA) is an integrated Financial Regulator and Supervision Agency [16], that covers the entire FSI landscape. It is a quasi-judicial body; a non-judicial body that can interpret the law [17]. and is the authorized institution to issue FSI regulations. FSA also supervise the implementation of regulations it makes.

In Indonesia context, FSA is an independent body that is mandated by the Indonesia's Law No 21 of 2011 to perform the functions, duties and given the authority to regulate, supervise, examine, and investigate FSI related infringements. Indonesia FSA also responsible for the education and protection of FSI consumer interest. Established in 2013, Indonesia FSA taking over roles of earlier institutions; 1) Bapepam-LK; the former regulatory and supervisory agency for Capital Market and Non-Bank Sector, and 2) Bank Indonesia; Central Bank of Indonesia, which was the supervisory and regulatory institution for Banking Industry. Indonesia FSA was formed to 1) ensure ordered, fair, transparent, and accountable conduct of FSI. 2) promote growing and stable financial system and 3) protect and educate consumers and entire FSI stakeholders [18].

3. METHODOLOGY

The study combines two well-established methodologies to gain the benefits of the two worlds and achieve its objective. First, it refers to TOGAF's Architecture Development Methodology (ADM) [19] to guide the process of data and information requirement identification based on FSA's legal duties and functions.

To understand the main challenges of data management, the study guided by DAMA-DMBOK2 or Data Management Book of Knowledge version 2; served as the reference for method, technique, and standard for data and information management. DAMA International: a non-profit organization and vendor-independent businesses association; develops DAMA-DMBOK2 as the valuable reference for any organization when planning and implementing data management.

DAMA-DMBOK2 served as the primary literature reference to identify the best practice in data management as the possible solution for the tabulated data and information requirements collected in the previous steps. The study then analyzes and concludes the related challenges to accommodate the needs in the Indonesia FSA context.

By adopting combined approaches, respectively TOGAF and DAMA-DMBOK2, the study can ensure the alignment of data and information requirements to the organization's strategic objectives and anticipate future challenges of its accommodation based on well-established management practice.

The Figure 1 depicts study steps that are adopted from ADM and DAMA-DMBOK2 as selected primary methodologies.

3.1 Establish Data Management Forum

Established data management communication forum and the working group comprises of several working units as data owner and/or currently performing data management functions in each respective sector or industry in the Indonesia FSA.

Each working unit sends its delegation to involves in the planning, coordination, execution, monitoring, and status reporting of the diagnostic activities. The forum is led by a working unit that consolidates all data from other units that represents

different sector and industries data management units.

3.2 Data Collections

Collect various data management related information as input for each phase, namely: i) Business Architecture; ii) Information System Architecture; and iii) Technology Architecture as per described in Figure 1. The data is collected through questionnaires to obtain the overall FSA data requirements and its characteristics.

The data collections cover the gathering of business requirements, current and future data and information requirements, current information systems architecture and inventories, and information technology infrastructure.

The questionnaires also inquire about the challenges and obstacles that are currently faced by each unit during the data management operational activities.

3.3 International Benchmark

Collect data through questionnaires from and/or perform interview with FSA from selected partner countries, which are: i) Australia; ii) Singapore; and iii) South Korea. The benchmark provides information about respective international data management related experience of similar organization in Asia Pacific region. The questionnaires covers the following area: i) Data Management Framework; ii) Organization Structure; iii) Roles and Responsibilities; iv) Policy, Process and Procedures; v) Data Governance, vi) Data Architecture; vii) Enterprise Data Model; viii) Metadata Management; ix) Data Storage and Operations; x) Data Security; xi) Data Consolidations; xii) Data Exchange; xiii) Unstructured Data Handling; xiv) Master Data Management; xv) Enterprise Data Warehouse (EDW) & Big Data; xvi) Data Quality Management; and xvii) Integrated Financial Service Reporting. The study compile and compare collected benchmark data to get the factual data management implementation options, key requirements, and challenges of similar organizations in the region.

3.4 Theoretical Analysis (ThA)

ThA is analysis of collected data that is carried out base on predetermined categories and aspects concluded from pre-comprehend knowledge of certain theory or earlier facts that are analyzed . In this study, data analysis on collected data mainly guided by DAMA-DMBOK2 data management Framework [12] and analysis result of International Benchmark on Data Management Implementation. As the outcome, collected data further summarized and categorized as key requirements and challenges. Each requirement and challenge item will be numbered and later presented as cross matrix.

4. RESULTS AND DISCUSSIONS

Currently, there is no published work on the method or results of the diagnostic study for data management in the FSA context elsewhere. This study fills the gap by presenting the processes and activities required to understand critical aspects of integrated data management implementation. The understanding is essentials to ensure the success of the integrated data management initiatives, especially for FSA.

By comprehending the entire landscape of integrated data management implementation, the organization will be able to plan the program implementation in a better way and avoiding unwanted pitfalls. This study also serves as the foundation for the next activity, which is the design of an integrated data management architecture for FSA.

The study collected the various data types and data characteristics from Indonesia FSA case as primary input for data analysis process as per exhibit in Table 5 which is exhibited in appendices section of this paper. The current data management condition/baseline is reflected by the collected data.

4.1 International Benchmark

In addition to that, the international benchmark activity concluded the data management activities implementation condition in 3 (three) areas, which are the organization model of governance structure, the adoption of data management framework, and the implementation of integrated information system as a tool to enable integrated data management. The following table show the summary of the benchmark results:

Table 1: Data Management Implementation International Benchmark Result

No.	Conclusion	Description
1.	Organization model: *Centralized*	All respective benchmark country implements centralized data management to gain optimal benefit

No.	Conclusion	Description
	Data Management	out of their organization and to promote business process efficiency and easier coordination.
2.	The adoption of Data Management framework	Most respective benchmark country confirmed the incremental and selective implementation of data management framework to ensure its effectiveness with careful consideration on organization's readiness, requirement, actual problems, and priorities.
3.	Integrated Information System	To develop and operationalized an integrated information system as the main strategy to enforce standardization and uniformity of approach, technology, and the implementation of key aspects of data management such as the management of data quality and data security.

Study founded differences between the result of benchmark with the current condition of data management operations.

4.2 Key Organization Requirements

Based on the current condition and the international benchmark result, the study tabulated the following key organization requirements with related to data managements for Indonesia FSA context:

Table 2: Data Management Key Requirements for Indonesia FSA

No.	Key Requirement	Description
1.	Establishment of Formal Data Governance Organization	To develop and establish the organization-wide data governance organization to provide data management's: i) vision, mission and strategic objectives and direction; ii) principle; iii) policies; iv) standards; v) organization structure; and v) processes; and to enact and oversees the entire data management activities throughout its lifecycle with the purpose of supporting the execution of FSA duties and responsibilities.
2.	Integrated FSI Data Architecture	To develop an integrated Data Architecture with the following key aspects: - Data Modelling Design Standard for entities, data domain, data types, and key attributes - Data subject area that classify and provide a clear and manageable data stewardship service area. The indicative data subject area for Indonesia FSA is exhibited in *TABLE 4. FSI Data Subject Area in Indonesia Context* - Conceptual Enterprise Data Model as the primary reference for logical and physical data model development with regards to application development within the organization - To develop FSI metadata which identifies, standardize and document data definitions, that is consisted of: i) business metadata, including meaning, glossary, references, taxonomies (classification structure and content), etc., ii) technical metadata; and iii) operational metadata
3.	Integrated Master Data and Reference Management	To centralized and integrate the management and use of master and reference data, including - Common references, such country, geographic location, administrative areas, and industries - FSI Stakeholders single identity that are mainly comprises of financial service companies, financial service professionals/executives, investor and consumers.
4.	Integrated FSI Enterprise Data Warehouse, Big Data, Analytical and Business Intelligence Platform	To established FSI integrated Data Warehouse, Big Data, Analytical and Business Intelligence platform that allows: - The consolidation of entire FSI data into a single repository - Collection and analysis of structured and unstructured data analysis - The building of descriptive, diagnostic, predictive and prescriptive data analytical capabilities - Business Intelligence platform that consisted of universal search capabilities, static reporting, ADHOC analysis, executive dashboard, and operational integration capabilities
5.	Integrated FSI Information Systems	To develop and implement an integrated data-management related information system that eases and simplifies data management activities. These systems comprise

No.	Key Requirement	Description
		of: - Electronic Licensing System - Electronic Reporting System; - Integrated Supervision System - Master Data Management (MDM) System - Enterprise Data Warehouse, Big Data and, Business Intelligence System - Integrated data publication and data exchange.
6.	Cater Essential Aspect of Data Management	To develop and implement policies, standards and processes that are related to essentials aspect of data management, including: - Data quality management - Data privacy and security - Data storage and operations - Document and records management - Data integration and interoperability.

The study also has identified data requirements that are can be further mapped into the following subject areas:

Table 3: FSI Data Subject Area in Indonesia Context

No.	Data Subject Area	Description
1.	Entities	FSI stakeholder's entities information; both companies and individuals, that are consisted of - General profile - offices - Ownership/shareholders - Management team (BOC/BOD) - Licenses - FSI products - Formal and informal affiliation.
2.	Risk and Compliance	The FSI risks and compliance information that are collected as part of regulatory reporting or other type of information submissions and collections, including: - Financial reports - FSI activities and transactions - risks and capital - Analytical data - Consumers and investors, comprises of general profile, facilities/portfolio, financial reports, collaterals and guarantors, assets and other liabilities.
3.	Track Records	Track records information that are documented during FSI Supervision activities, that are comprises of - Surveillance or onsite supervision activities - Consumer complaints - Examinations - Investigations - Litigation. Most of these data are classified strictly confidential.
4.	Supporting Data	Other types of data that are required to understand the external factor that could influenced FSI, which are - Economic data, both National and International - Other benchmark data.

4.3 Main Challenges

The study identified the main challenges of fulfilling the data management key requirements based on the current condition. These challenges sourced from internal and external factors. The challenges should be addressed respectively to accommodate the data management requirements.

The main challenges are categorized into the following data management areas:

Table 4: FSI Data Management Main Challenges for Indonesia FSA

No.	Main Challenges	Description
1.	Organization Change Management	The accommodation of key requirement in the data management area potentially imposes a certain degree of change to the way organization structured and operates. Some of the change may be required in the core activities such as in surveillance and supervision area. The changes need to be planned and carried out with a proper approach to promote organization readiness and stakeholder acceptance.
2.	Variety of Supervised Industries	There are 40 FSI sub industries that are supervised by Indonesia FSA, that shared similarities and possess specificity and unique characteristics, in term of requirement and challenges.
3.	Information System Integration and	Currently, there are more than 70 information systems that are operated by Indonesia FSA. The development of the new information system, the

No.	Main Challenges	Description
	Transition	integration and the transition process to the desired Integrated Information System should be carefully planned and executed to deal with its complex nature.
4.	External Change Management	The changes within the organization related to data management initiatives will eventually affect to external parties. Based on collected data by this study, there are around: - 6,000 FSI Companies - More than 20,000 professionals/executives - 90 state institutions that are might be affected by any change of regulation related to regulatory report or other information submission obligation and data exchange format.

The cross-matrix figure between key challenges and main challenges are further presented in

Table 6. The figure explained how different challenge the respective data management requirements.

5. CONCLUSIONS AND FUTURE WORK

The study has identified: i) the current condition of data management implementation, ii) the summary of international benchmark result for data management implementation, iii) the key requirements of data management related aspects, and the challenges around the implementation of integrated data management. Any FSA could use the study result as practical reference for identifying the key requirements and main challenges as primary input to move to the next step, which is the design of Integrated Data Management Architecture (IDMA) for the entire FSI.

The key requirements mainly driven by related data and information requirement based on FSA duties and functions, while the main challenges are resulted from the complexities around the effort required to address the identified requirement. The study concludes that Indonesia FSA data management related key requirements is large in term of variety and broad in term of scope. Along with its variety, each requirement is related to challenges that represents the actual characteristics conditions and environment of FSI in Indonesia. Some of the requirements and challenges may be generic, some might only be applicable for Indonesia context.

This study used qualitative analysis to draw its conclusions. Most of the study's results are presented to the user without further validation on the acceptance from the end-user. Thus, the result is a subjective analysis and discussion of the researchers and a limited audience from the Indonesia FSA. Future research should also validate the output of this study by confirming using quantitative analysis or after the integrated data management implementation in Indonesia's FSA or elsewhere.

Future study is required to map and design IDMA components, identify the gap with current condition and develop implementation roadmap to improve the chance of successful data management framework adoption.

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APPENDICES

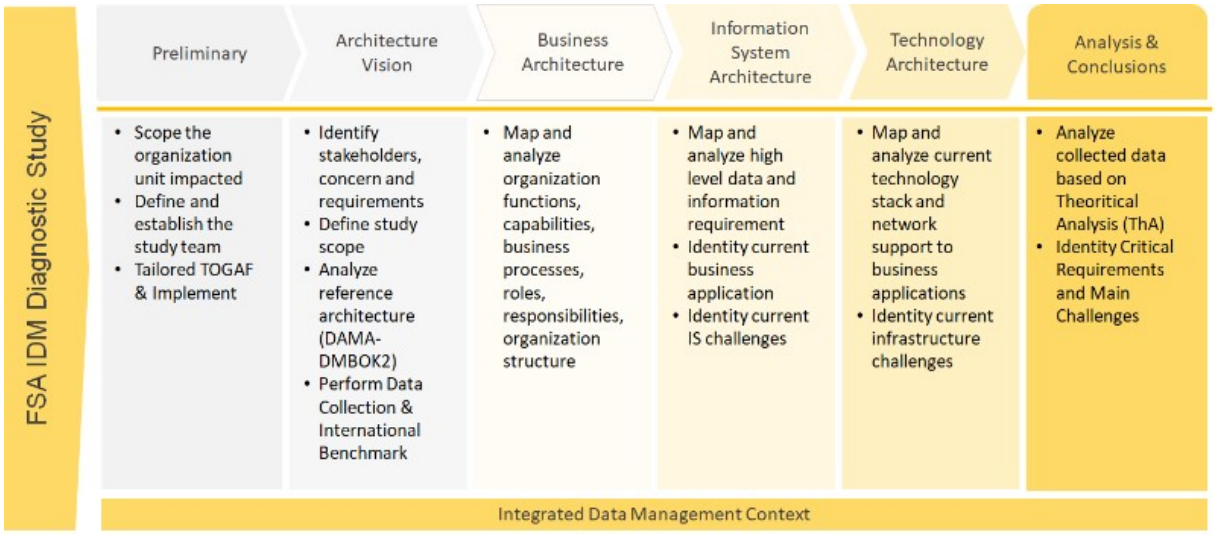

Figure 1: Study Methodology Adopted from The Open Group Standard [11] *and C. Houghton, K. Murphy, D. Shaw, dan D. Casey* [20]

Table 5: Type of Collected Data and Its Characteristics

Category	Integrated Data Management Context			
	Business Architecture	Information System Architecture		Technology Architecture
		Data Architecture	Application Architecture	
Data Type	- Working Unit General Profile - Related Regulation - Related Business Process - Organization Structure	- Regulatory Report - Shared Data to Other Unit - Data Exchange with External Party - Incidental Data Requirement - Self-Managed Data - Data Processing Activities - Report and Publication	Information System Catalog	Infrastructure Catalog (Hardware, Software and Network)
Data Characteristics	- Sector/Industry Coverage - Organization Structure - Duty - Organization Unit - Working Units - Business Process - Related Parties - Related Regulation Types	- Data Category - Data Format - Data Origin - Report Submission Method - External Data Receive Method - Data Confidentiality Type - Activity Period Type - Data Availability Status Type	- Application Usage Status - Inactive Application - Reason Status	- Type of Technology - Operating Systems - Hardware - Software Type - Programming Language Type

Category	Integrated Data Management Context			
	Business Architecture	Information System Architecture		Technology Architecture
		Data Architecture	Application Architecture	
		- Publication Status - Related External Party		

Table 6: Data Management Key Requirements and Its Main Challenges

No.	Key Requirements	Main Challenges			
		Organization Change Management	Variety of Supervised Industries	Information System Integration and Transition	External Change Management
1.	Establishment of Formal Data Governance Organization	New Organization Structure Change of Job Definition	Coordination with data owners and other stakeholders from each sub-Industry	Coordination with IT Organization	A possibility of new data management related standards such as in data quality and data security management area
2.	Integrated FSI Data Architecture	Development new and synchronize existing related regulation	Identify redundancy in data definition, remove duplicate and consolidate into single definition Implement it to regulatory reports and information systems	Flexibility to adopt changes in the future	Change of Regulatory Report Approach and Format Change of Data Exchange approach and Format
3.	Integrated Master Data and Reference Management	Data Manage-ment related Business process change	Reach consensus among different sub industry internal stakeholders	Build a robust and adaptive master data and reference management	Change to regulatory and data exchange format and content Change to several processes due to single identity implementation
4.	Integrated FSI Enterprise Data Warehouse, Big Data, Analytical and Business Intelligence Platform	Building data analytic culture Internal capacity building	Cater specific requirement and characteristics of different sub industries	Ability to consolidate large volume of data for the entire FSI Integration of data analytic output with other FSI supervision operational systems	Change to regulatory and data exchange format and content
5.	Integrated FSI Information Systems	Internal capacity building	Flexibility to adopt to different requirement and characteristic of different sub industry within a single system	Flexibility to adopt changes in the future Integration among existing system Migration from old to new system Integration with the future system	Change to regulatory and data exchange format and content Change to FSI supervision processes due to implementation of new information system

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No.	Key Requirements	Main Challenges			
		Organization Change Management	Variety of Supervised Industries	Information System Integration and Transition	External Change Management
6.	Cater Essential Aspect of Data Management	Enact and Enforce policies Business Process Changes	Coordination with data owners and other stakeholders from each sub-Industry	Consistent implementation of related data management strategies & policies into information system	A possibility of new data management related standards such as in data quality and data security management area