ERM Business Architecture

A Holistic Business Driven Architecture Approach towards Enterprise Risk Management

A plethora of regulations, evolving risk management methodologies, complex financial instruments and globalization have all contributed towards increasing the complexity and scope of the risk landscape across the banking and financial services industry. Risk management is no longer perceived as a compliance initiative, but is increasingly being regarded as a key horizontal function cutting across organizational silos comprising business units, portfolios and support functions of the bank. This has led to an exponential increase in the business capabilities, supporting information technology (IT) systems and volume of information falling under the purview of Risk Management.

Not surprisingly, banks across the globe are finding it increasingly challenging to keep up with the pace of business capability needs related to risk management and are either procuring new proprietary risk solutions or developing them in-house, which is further contributing to the disconnect between business and IT. Although additions to the existing risk management architecture help in closing identified gaps and are a necessity, it is critical to understand their specific role in the bank’s enterprise risk landscape from a holistic perspective. Ad-hoc additions may meet the short term needs of compliance but tend to fail in providing a strategic benefit to the bank in the long term.
Hence, there is a growing need for banks to derive a holistic view of the enterprise risk landscape both from a business and technology perspective. As a first step, banks can develop an end-to-end business driven architecture encompassing all the key risk capabilities and functions. Such a business driven architecture would eventually enable a greater alignment of the risk business along with multiple other business benefits.

For banks to fully realize the benefits of a business driven Enterprise Risk Management (ERM) architecture, it is important to develop and support the architecture on a standard enterprise architecture tool which can empower the bank to slice and dice risk information and enable tactical as well as strategic decision making. It will also enhance the progressive utility of ERM architecture by enabling greater ability to address newer regulatory and business changes. It is however essential for businesses to fully understand the critical success factors for developing an ERM architecture which is capable of creating business value and enabling a more robust ERM adoption.
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1. Introduction

The global risk environment has been undergoing rapid changes since the onset of the financial crisis and has become increasingly dynamic and unpredictable. Multiple regulations such as Basel III, Dodd-Frank, and Liquidity Risk have been introduced, thereby adding to the complexity of the enterprise risk landscape. There is a growing realization among banks that a better understanding of the existing risk landscape is essential to respond to future regulatory requirements in a timely and efficient manner. Banks are therefore looking for an integrated view of their risk management capabilities, functions and solutions across the Enterprise Risk Management (ERM) value chain. Such an integrated view can be enabled through a business-driven Enterprise Risk Architecture.

This paper takes a closer look at some common challenges faced by banks in the enterprise risk management process and proposes an innovative business architecture led approach for addressing them. It also provides insights into adoption of enterprise risk architecture tools for effectively managing the complexity of the architecture initiative thereby making it sustainable.

2. Leveraging ERM for strategic benefits

The current business, economic and risk landscape is highly volatile and complex. Banks need to proactively assess, analyze and monitor the risk scenario in order to take informed business decisions. This section focuses on the key challenges that banks face from a risk perspective and how a robust ERM driven architecture framework can help in navigating through the complex and turbulent risk landscape.

2.1 Drivers and Challenges of a Complex Risk Landscape

The risk landscape for banks has gone through a remarkable transformation over the last few years. New regulations, emerging trends in risk management and introduction of complex financial products are the key drivers of an increasingly complex risk landscape and its related challenges.

Newer financial regulations such as Basel III and DFA require banks to build in additional business capabilities in order to manage their risks more effectively. This introduction of newer capabilities and supporting technology solutions are expanding the ERM landscape and making it more comprehensive and complex.

*Eg: Development of business capabilities to compute LCR and NSFR (Basel III).*

Banks are looking to stay competitive and survive the aftermath of the financial crisis by adapting to emerging risk management trends in the banking and financial services sector which is forcing them to evaluate and review their overall ERM capabilities.

*Eg: Development of exclusive economic capital model for liquidity risk.*

Introduction of newer financial products into the market has an impact on the risk management function in terms of identifying applicable risks for the given product/service, quantification of these risks, the requisite controls and monitoring them effectively on an ongoing basis.

*Eg: Introduction of complex securitization and derivative products.*

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Figure 1: Drivers of a Complex Risk Landscape
The prevailing dynamic risk environment is throwing up a lot of challenges for banks from an Enterprise Risk Management perspective. Managing risk in a sound and transparent manner, responding to regulatory requirements and making well informed business decisions seems to be the need of the hour for banks across the globe. Some of the key challenges on account of an increasingly complex risk landscape are given in Figure 2.

**Lack of a holistic view**
Banks are finding it increasingly difficult to fully understand the interdependencies among the various risk components both on the business and technology space due to lack of a holistic view of the enterprise risk landscape.

**Disparity between business and technology**
Due to the dynamic risk environment, banks are either procuring risk solutions or developing the same internally to meet regulatory and compliance needs related to risk management without fully understanding the underlying business capabilities, which is further adding to the disparity between business and technology.

**Compliance cost and timelines**
Due to lack of a holistic view and multiple risk initiatives operating parallely in a siloed manner, banks are unable to identify gaps early in compliance programs which can impact timely compliance. Also, not being able to identify and understand the overlaps that may exist can lead to high operating and compliance costs for banks.

**Response to emerging regulatory requirements**
Due to the lack of a holistic view of ERM, banks are finding it increasingly challenging to respond to the newer regulatory requirements (Basel III, Liquidity Risk Management, Dodd Frank, etc.) as there is limited understanding of current state risk architecture, capabilities and risk solutions.

**Lack of a domain expertise**
Banks are finding it increasingly difficult to find resources that have strong knowledge of risk management domain and awareness of the emerging trends and industry best practices from the perspective of ERM.

**Figure 2: Challenges of a Complex Risk Landscape**
2.2 Enhanced ERM through Business Driven Architecture

The ERM landscape is quite complex with a number of components dynamically interacting with and interdependent on each other. It is imperative for banks to manage these components in an integrated manner and a business driven architecture provides the perfect foundation for an effective and enhanced Enterprise Risk Management framework.

Enterprise Risk Management needs to be flexible and agile to be able to respond effectively to the challenges thrown by a dynamic risk environment, and a business driven architecture provides the right foundation for Enterprise Risk Management.

It not only provides an enhanced visualization of all the existing risk capabilities with their interdependencies but also the ability to reuse business capabilities while evaluating the impact and determining the roadmap to address applicable business and regulatory changes.
3. Solution – ERM Business Architecture

3.1 What is an ERM Business Architecture

An ERM business architecture encompasses all the key business functions and processes and their interdependencies and relation from the perspective of Enterprise Risk Management. It intends to provide a holistic view of the overall risk landscape and a robust business oriented platform for mapping the respective risk solutions and high level information segments in order to derive business driven application and information architecture.

An ERM business architecture should encompass all the key risk functions across all risk types and segments of the risk value chain. There are multiple levels on which business architecture can be developed, with level 0 business architecture identifying all the processes to the subsequent level decomposing these processes and showing relation and interdependencies among the various processes and sub processes. Depending on the complexity of the risk landscape, the level of business architecture can be defined.

3.2 Approach and Building Blocks of a Business Driven ERM Architecture

Understanding the business end-to-end is the key to developing business architecture. As seen in the figure 4, the first step towards developing business architecture is to understand the current state of the enterprise risk landscape and identify all the material risk types and the corresponding risk functions under them. Subsequently multi-level business architecture needs to be developed which can then be used as a platform to overlay the technology components to derive a business driven ERM architecture framework.
There are a number of business and technology architecture artefacts that need to be produced as part of the ERM architecture framework. Figure 5 provides a representation of the key building blocks that are part of the ERM architecture and the enablers which help us provide the required inputs to develop both the business as well as the technology architecture artefacts.

**Figure 4: Approach towards building a business driven ERM Architecture**

- **DISCOVER** (Study the Landscape)
  - Study of the current state of the existing enterprise risk landscape.
  - Identification of all material risk types and their key functions.
  - Drafting the level 0 business architecture encompassing all key business functions across the risk value chain.

- **DEFINE** (Business Architecture)
  - Developing the level 1 business architecture which depicts the relationships between the key risk functions identified in the level 0 context diagram.
  - Level 2 and subsequent levels of business architecture to further decompose the risk functions retaining the level 1 relations.

- **ALIGN** (Overlay Technology)
  - Overlaying the applications/systems on the level 2 business architecture.
  - Overlay of application and systems for every risk function in the business architecture to capture 360-degrees view.
    - System of input
    - System of execution
    - System of publication
    - System of consumption

- **DEVELOP**
  - Developing an integrated application architecture based on the system overlay information.
  - Overlay the high level information segments on the application architecture to derive information architecture.
  - Overlay of other technology information (infrastructure, servers, business day processing etc.) to develop other technology architecture artifacts.
3.3 High Level Methodology to Derive a Business Driven ERM Architecture

A business driven ERM architecture begins with defining the Level 0 context diagram which identifies all the key business capabilities within the purview of ERM. Level 0 is leveraged to derive the level 1 business architecture which in addition to decomposing the level 0 business architecture defines the high interdependencies among the business capabilities and subsequently the Level 2 business architecture is developed leveraging the level 1 business architecture retaining the defined interdependencies and further decomposing the capabilities to a more detailed level.

Once the detailed business architecture is completely defined, each capability within the ERM business architecture needs to be overlaid with its respective application/system information. It is important to note that information on capabilities that are supported by spreadsheets and manual processes also need to be gathered as part of the system overlay process with the appropriate tagging to identify them for any subsequent system rationalization initiatives. The information on the system needs to be gathered along the following 4 dimensions – input, execution, and publishing and consumption. Also, there could be a possibility of more than 1 system supporting the business capability across the four dimensions mentioned earlier. For example, if there is a capability on regulatory capital computation, then all the applications/systems enabling the business capability need to be identified in relation to the role they
play from a technology perspective. We could have systems A and B providing inputs, system C executing (realizing) the business capability, system D publishing, while systems E and F could be the consumption systems.

Once the system overlay has been completed, it can be leveraged to derive an integrated ERM application architecture. For example, system A could be playing different roles for different business capabilities. It is important to identify (one alternative is colour coding) and tag the role of the system with respect to the business capability. If system A is the system of input for regulatory capital and C is the system of execution for retail segmentation, then these business capabilities must be clearly defined and identified in the application architecture.

Once the application architecture has been defined with their respective interactions, it is also important to map the high level flow of information segments from one system to another in the context of the business capability they support. For example: if system A is the system of input and system C is the system of execution then we would need to identify the high level information segments that flow between these two systems in the context of the given business capability. This mapping of information segments enables us to derive the ERM information overlay and subsequently the ERM information architecture. The architecture could be further leveraged to map the business day on which a given information segment flows from one system to another in the context of a given business process.
The level 2 business architecture is primarily a detailed decomposition of the level 1 business architecture which would retain the interaction between the risk capabilities established in the level 1 business architecture. The level 2 business architectures for each of the primary risk types would provide a holistic view of risk management capabilities and the relationships that exist between them.

The level 1 business architecture depicts the high level interactions between the risk capabilities identified in the level 0 context diagram. The level 1 business architecture decomposes the risk capabilities at a high level and further defines the relationship that exists between the risk capabilities from an ERM perspective.

Example: Internal credit ratings as a capability would feed into the capital calculation process which could further feed into internal and external credit reporting.

3.4 Business Driven Architecture Artefacts

There are a number of business and technology architecture artefacts that need to be produced as part of the ERM architecture framework. A representation of the key architecture artefacts that need to be developed as part of the architecture framework are given below (Table 1):

<table>
<thead>
<tr>
<th>ARTIFACT</th>
<th>DESCRIPTION</th>
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| Level 0 Context Diagram       | The level 0 context diagram contains all the key risk capabilities from an ERM perspective and would be organized as per the respective risk type and the dimension of risk management value chain they belong to. The primary objective of the level 0 context is to identify all the key capabilities that need to be further decomposed in the level 1 and level 2 business architecture.  
  Example: Credit economic capital calculations would be a capability identified under credit risk as a risk type and under risk assessment dimension of the risk value chain. |
| Level 1 Business Architecture | The level 1 business architecture depicts the high level interactions between the risk capabilities identified in the level 0 context diagram. The level 1 business architecture decomposes the risk capabilities at a high level and further defines the relationship that exists between the risk capabilities from an ERM perspective.  
  Example: Internal credit ratings as a capability would feed into the capital calculation process which could further feed into internal and external credit reporting. |
| Level 2 Business Architecture | The level 2 business architecture is primarily a detailed decomposition of the level 1 business architecture which would retain the interaction between the risk capabilities established in the level 1 business architecture. The level 2 business architectures for each of the primary risk types would provide a holistic view of risk management capabilities and the relationships that exist between them. |
An information architecture can be derived based on the information segment overlay on the application architecture in relation to the business function that is supported by the application/system.

The business architecture can be further leveraged for mapping multiple other technology dimensions (on the application architecture) such as information calendar, infrastructure, etc. to derive a holistic ERM architecture framework.

<table>
<thead>
<tr>
<th>ARTIFACT</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>System and Information Overlay on Level 2 Business Architecture</td>
<td>System and information overlay on level 2 business architecture are artifacts which provide a focused view of all the systems that support a given risk capability. The system overlay will capture systems from four dimensions:</td>
</tr>
</tbody>
</table>
| | - System of input  
| | - System of execution  
| | - System of publishing  
| | - System of consumption  
| | In addition to the four dimensional system view, the high level information segments across each of the dimensions supporting the risk capability would also be captured. |
| Example: Credit economic capital calculations would be a capability identified under credit risk as a risk type and under risk assessment dimension of the risk value chain. |
| Application Architecture | Based on the system overlay on the business architecture, an integrated application architecture can be developed which encompasses all of the key risk solutions of the bank and shows the interdependencies among these systems respective to the relation among the risk capabilities which they support. |
| Information Segment and Other Technology Overlay | An information architecture can be derived based on the information segment overlay on the application architecture in relation to the business function that is supported by the application/system. |
| | The business architecture can be further leveraged for mapping multiple other technology dimensions (on the application architecture) such as information calendar, infrastructure, etc. to derive a holistic ERM architecture framework. |

**Table 1 – ERM Architecture Artefacts**

### 3.5 Business Benefits

A business architecture provides a strong foundation to develop a robust ERM framework to address the challenges of an increasingly complex and dynamic risk environment. Some of the key benefits which banks can derive from an ERM business architecture are described in Figure 8.
Figure 8: Business Benefits of ERM Architecture

- **Holistic View**: Enables the key stakeholders from business and technology to understand the interdependencies, identify gaps and overlaps among the various components in the ERM landscape. This will enable banks to manage the timelines and cost of risk and compliance programs more efficiently.

- **Timely response to Regulations**: ERM business architecture provides a holistic view of the existing risk landscape and can be leveraged to develop the future state architecture and subsequently enable gap analysis and implementation roadmap for newer regulatory compliance programs such as Basel III, LRM and DFA.
  
  For e.g.: If there is a requirement as part of the new regulatory guidelines to compute stressed value-at-risk (VaR) in addition to the regular VaR, then all of the building blocks in the architecture for VaR computation can be leveraged to derive the future state architecture for stressed VaR.

- **Optimization & Rationalization**: An ERM architecture provides an integrated decomposition of business and the related technology solutions supporting them, which can be leveraged for potential business and technology optimization exercises and for making product/solution buy and build decisions.
  
  For e.g.: The forecasting of capital across commercial credit risk and consumer credit risk could leverage common forecasting scenarios and use the same solution platform to procure macroeconomic information.

- **Business & Technology Alignment**: A business driven architecture provides a platform to overlay risk systems and information segments to the corresponding business functions, making them completely traceable and thus further aligning business to technology.
  
  For e.g.: There could be multiple Risk solutions that could support the ICAAP reporting process under the Basel Pillar 2 Requirements. If all these systems are mapped to the underlying business functions and Risk types, through a Business driven architecture, then there will be greater alignment of Business to Technology.

- **Supports Internal & External Review**: A business driven ERM architecture encompasses an integrated view of the key risk components both on the business and technology side which can be leveraged for supervisory review process under the various compliance programs.
  
  For e.g.: The ERM architecture could be leveraged to highlight the Basel specific components during the pillar 2 supervisory review process.

- **Master Reference Architecture**: An ERM architecture can act as master reference architecture for all the risk and compliance initiatives within the bank and align their respective architecture and solutions.
  
  For e.g.: Regulatory capital or economic capital initiatives can leverage the ERM architecture to align their individual Initiative level architectures to meet the program objectives.
3.6 Progressive Utility of an ERM Architecture

An ERM business architecture provides a holistic view of the existing risk landscape encompassing all the risk functions across the enterprise. It can be leveraged to develop future state architecture and gap analysis and implementation roadmap for newer regulatory compliance programs such as Basel III and Dodd Frank Act. The time required by banks to respond to such regulatory requirements will be much shorter and the overall program implementation will be more efficient.

For example, if there is a requirement as part of the new regulatory guidelines to compute a capital charge for credit valuation adjustments for counterparty exposures, then all of the building blocks and the architecture for the regulatory capital quantification of counterparty credit risk can be leveraged to derive the future state architecture with the additional business component (credit valuation adjustments charge) for the incremental change.

Figure 9: Leveraging ERM Architecture for Newer Regulations
4. Leveraging Enterprise Architecture Tool for ERM Architecture

Architecture artefacts are most commonly developed on a simple Visio or word document which restricts its usage beyond academic value. For an ERM architecture to be really effective, it needs to be actionable and provide banks the flexibility to slice and dice information across any of the dimensions.

**Key Business Benefits**

- Flexible platform to carry out business impact analysis – The relations established among the business processes, information, systems etc., in the architecture modeling within the tool provide the flexibility to carry out business impact analysis for any given business event (process change or system outage).
- Lesser time to respond to regulatory requirements - An Enterprise Architecture (EA) tool enables the bank to view selective risk information (relevant processes, systems etc.,) for any given business scenario instantly, thus reducing the time to respond to any regulatory requirements.
- Ongoing maintenance is simplified - Unlike a Word or a Visio diagram, an architecture developed on an EA tool simplifies the ongoing maintenance of the artifacts and enables efficiency in future architecture enhancements through collaborative repository based environment for (reusability, knowledge management etc.,)

**What is ERM architecture digitization**

The development of the ERM architecture artifacts on an enterprise architecture tool as against any other non interactive solution (Visio, Word, etc.,)

**Need for ERM Architecture Digitization**

To empower the bank to slice and dice information across multiple business and technology dimensions for its strategic planning and decision making and develop an effective and timely response to the challenges of a dynamic risk environment.

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**Figure 10: ERM Architecture Digitization**
5. Critical Success Factors

The critical success factors for developing ERM business architecture are strong domain knowledge, an understanding of the enterprise risk landscape, knowledge of emerging trends in risk management, industry best practices and reference business architecture built on industry experience, emerging trends and best practices.

![Diagram of Critical Success Factors]

- **Holistic View**: The risk components of the ERM architecture need to cut across the various risk types and the multiple dimensions of the risk value chain to enable a holistic view.
- **Emerging Trends & Best Practices**: Emerging trends in risk management and industry best practices need to be incorporated into the ERM architecture development for it to be current and agile in a dynamic risk environment.
- **Reference Business Architecture**: A reference ERM business architecture would not only accelerate the process of developing a business driven ERM architecture but would also act as a reference architecture for multiple risk programs in the bank.
- **Domain Enrichment**: Strong domain expertise on risk management is essential in order to develop a robust business architecture which decomposes the risk capabilities and identifies the relations between them.
- **Digitization**: To empower banks to leverage this business driven architecture for decision analysis and strategic planning it is imperative for these artifacts to be digitized in a robust EA tool.

Figure 11: Critical success factors in developing business driven ERM architecture
6. Conclusion

Considering the implications of an increasingly complex risk environment and the challenges faced by banks, it is imperative for banks to take a business driven and holistic approach towards understanding the risk landscape. An Enterprise Risk Management (ERM) architecture definition is the key to achieving a holistic view of the risk landscape and it is important for it to be completely business driven to make it robust, comprehensive and completely traceable.

The key to developing a robust business driven ERM architecture is domain expertise, understanding of the overall risk landscape and knowledge of the emerging trends in risk management and industry best practices. The ERM business architecture will provide the foundation for developing an effective Enterprise Risk Management framework which can confront the challenges thrown by a dynamic and complex risk environment.
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