Designing loss event database using evolutionary prototyping model to perform bank operational risk management identification process

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Abstract. Many banks in Indonesia have failed in the process of transformation towards their vision, due to a lack of awareness in managing risk and not growing a risk-based culture. The external and internal environment of the banking system is experiencing rapid development which will be followed by increasingly complex risks for banking business activities. Loss Event Database is a solution to perform the function of identifying and measuring Operational Risk Self-Assessment. The research method used to design and build a Loss Event Database refers to the Evolutionary Prototyping model where at each stage, the involvement of developers and users is intensely carried out. The implementation of Operational Risk Self-Assessment through the development of a Loss Event Database using the Evolutionary Prototyping model is able to reduce the operational risk rating from the Moderate to Low to Moderate level, meeting the requirements of good corporate governance in accordance with applicable regulations and best practices in the banking world.

1. Introduction
Designing Loss Event Database is believed to increase performance of bank operational risk management identification process. Many banks in Indonesia fail in the process of transformation towards their vision because it reduces awareness in overcoming risks and does not foster a risk-based culture [1]. The external and internal environment of the banking system is experiencing rapid development which will be followed by increasingly complex risks for banking business activities [2]. The increasing complexity of risks for banking business activities will increase the need for good governance practices and the identification, measurement, monitoring and, risk management functions of banks. The improvement of the functions of identification, measurement, monitoring, and risk control is intended so that the business activities carried out by banks do not cause losses that exceed the ability of banks or that can interfere with the continuity of bank business [3]. The management of each functional bank activity must be integrated into a system and process of risk management that is accurate and comprehensive as far as possible [4]. One significant risk that has a big problem is operational risk. Operational risk is a risk inherent in all banking activities and work units of the Bank, so awareness of operational risks by work units is a must [5].

The trend of operational risk exposures at the Bank experienced a significant increase in all work units. This is due to the lack of adequate methodology and Operational Risk Self-Assessment tools and
HR competencies. Adequacy of a proper Operational Risk Self-Assessment will enhance the strength of the Bank's risk governance structure [6].

The implementation carried out in managing operational risk is the availability of an operational risk loss database. Without an adequate loss database, banks will experience difficulties in the process of preparing an operational risk loss measurement model [7,8].

The operational risk loss database is a way for companies to find out historical operational risk events that cause losses to the company, the recording is useful for knowing the strength of bank capital and as an experience for banks to mitigate future risks [9].

Each bank must conduct an Operational Risk Self-Assessment, which aims to continuously develop and maintain a management plan and the application of risk management as an integral part of the corporate governance framework in achieving company performance targets [10].

2. Methods
The research model used is an implementation of the Evolutionary Prototyping Model [11]. The following is an illustration.

![Evolutionary Prototyping Model](image1)

**Figure 1.** Evolutionary prototyping model [11,12].

This study also uses a qualitative approach that will be used in the design of the Loss Event Database using the Evolutionary Prototyping model as a Software Development Life Cycle with the steps as shown below.

![Qualitative Method](image2)

**Figure 2.** Stages of qualitative methods with evolutionary prototyping model.
3. Result and discussion

3.1. Business process

Based on the requirements gathering results, Figure 3 shows the business process of implementing the Risk Management Information System that will be developed.

![Business process of risk management information system](image)

**Figure 3.** Business process of risk management information system.

The Loss Event Database business process that is part of the Risk Management Information System can be seen in Figure 4 below. The business process of implementing the Loss Event Database is in accordance with the regulations in force in national banks [13].
The Loss Event Database developed starts from the input of the main parameters. After the parameters are well defined, proceed with filling in the Risk Event, Risk Assessment, and Action Plan.

3.2. User requirement analysis
Mapping user needs related to the design of the Loss Event Database to be developed can be seen in Table 1.

| Role          | Risk Management | Head Office | Branch Office |
|---------------|-----------------|-------------|---------------|
| Approver      | Division Head   | Division Head| Branch Manager|
| Checker       | Group Head      | Group Head  | Manager       |
| Maker         | Officer         | Officer     | Supervisor    |
| Administrator | Staff           | -           | -             |

3.3. Sitemap design
The Loss Event Database that will be developed consists of several primary modules, namely Dashboard that can be accessed by all User Categories, Master Parameters that can only be accessed by Administrators in the Risk Management Working Unit, Maker-based LED Working Paper,
checkers, approvers that can be accessed by Risk Management Working Unit and Risk-Taking Unit and Report. Next Figure 9 is a Sitemap of the menu management developed.

![Figure 5: Loss event database sitemap.](image)

### 3.4. Database design

Database design that will be applied to the implementation of Loss Event Database can be seen in Table 2 below.

| Table Name         | Fields                                                                 |
|--------------------|------------------------------------------------------------------------|
| TUser              | User_ID (PK), UserName, ID_User_Group (FK), Pass, ID_WorkingUnit, Status |
| TUserGroup         | UserGroup_ID (PK), UserGroup, Desc, Status                             |
| TPosition          | Position_ID (PK), PositionName, Desc, Status                           |
| TWorkingUnit       | WorkingUnit_ID (PK), Parent_ID (FK), 3LoD, WorkingUnitName, Desc, Status |
| TProduct           | Produk_ID (PK), ProductCode, ProductName, Desc, Status                 |
| TAffectedRisk      | Aff_Risk_ID (PK), AffRiskName, Desc, Status                            |
| TRiskRating        | RiskRating_ID (PK), TriggerActPlan, RiskRatingName, Desc, Status       |
| TThirdParty        | ThirdParty_ID (PK), ThirdPartyName, Desc, Status                       |
| TProcessStatus     | ProcessStatus_ID (PK), NextProcessStatus_ID (FK), ProcessStatusName, Cond, Stat |
| TAssessmentPeriod  | AssessmentPeriod_ID (PK), AssPeriodName, Desc, Status                  |
| TRiskCategory      | RiskCat_ID (PK), RiskCatName, Desc, Status                             |
| TMainCause         | MainCause_ID (PK), OpRiskCat, MainCauseName, Desc, Status              |
Table 2. Cont.

| Table | Columns |
|-------|---------|
| TCurrent Control | CurrCtrl_ID (PK), CurrCtrlName, Desc, Status |
| TLossCategory | LossCat_ID (PK), LossCatName, Desc, Status |
| TFrequency | Frequency_ID (PK), FrequencyName, Desc, Stat |
| TImpact | Impact_ID (PK), ImpactName, Desc, Stat |
| TRiskMatrix | RiskMatrixID (PK), FrequencyID (FK), ImpactID (FK), RiskRatingWeight, ColorCode, Status |
| TRiskEvent | RiskEvent_ID (PK), UserID (FK), WorkingUnitID (FK), ReportDate, EventDate, ProductID (FK), RiskCatID (FK), RiskEvent, Desc, ThirdPartyID (FK), MainCauseID (FK), LossCatID (FK), Nominal_Loss, Aff_Risk_ID (FK), ActionTaken, SupportDoc, ProcessStatusID (FK) |
| TAssessment | Assessment_ID (PK), RiskEventID (FK), UserID (FK), CurrCtrlID (FK), EventImpact, RiskRatingID (FK), Recomendation, SupportDoc, ProcessStatusID (FK) |
| TActionPlanLED | ActionPlanLED_ID (PK), RiskEvent (FK), Assessment_ID (FK), ActionToBeTaken, UserID (FK), StartDate, EndDate, Recovery, RecoverySource, SupportDoc, ProcessStatus (FK) |

3.5. Database design

The hardware and network design used in this study can be seen in Figure 10 as follows.

![Figure 6. Hardware and network design.](image)

4. Interface design

User Interface Design is a design for software applications that focus on user experience and interaction between users and application. Following some interfaces design of the Loss Event Database (LED) application and the explanation can be seen as follows:
- Input Risk Event Menu, is a menu intended for the Risk-Taking Unit to manage Risk Events. This menu can be seen in Figure 7 below.

![Figure 7. Input risk event.](image)

- Loss Frequently Trend Menu. This menu can be seen in Figure 8 below.

![Figure 8. Loss frequently trend.](image)

- Risk Matrix Menu, an operational risk measurement menu, which shows the level of risk ranking based on risk events viewed from the frequency and impact caused. This menu can be seen in Figure 9 below.
5. Conclusion

Based on the results of the research conducted, the design of the Loss Event Database was able to answer all the hypotheses above. Conclusions obtained in the research include Loss Event Database has the ability to collect various types of operational risk events that are integrated between internal events based on POJK and external risk events originating from other banking industries, data loss consortia, and media coverage, including mapping the frequency and impact of their occurrence. In addition, the Loss Event Database is able to make a model of measuring operational risk loss and is a validation tool for each risk assessment or prediction process so as to ensure that the internal operational risk control process is sufficient.

References

[1] Hamdani N A, Susanto T and Maulani G A F 2018 Framework of Architectural Marketing Capabilities in Regional Development Bank Int J Eng Technol 7(325) 166-169
[2] Hamdani N A and Maulani G A F 2018 Analysis of Marketing of Sharia Banking Service Products Based on Consumer Perception
[3] Supriyatna A, Yulianto E, Hamdani N A and Maulani G A F 2019 Budaya Perusahaan: Penerapan Good Corporare Governance Serta Implikasinya Terhadap Keberlanjutan Kinerja Bank Business Innovation and Entrepreneurship Journal 1(1) 11-20
[4] Setiawan A and Yulianto E 2019 Penerapan Data Mining Dengan Association Rules Untuk Melihat Hubungan Tertanggung Pemilihan Produk Dan Perilaku Nasabah (Studi Kasus: PT Prudential Life Assurance) Journal Accounting Information System (AIMS) 2(1) 1-17
[5] Martínez-Sánchez J F, Martínez-Palacios M T V and Venegas-Martínez F 2016 An analysis on operational risk in international banking: A Bayesian approach (2007–2011) Estudios Gerenciales 32(140) 208-220
[6] Hill J 2018 Fintech and the remaking of financial institutions (Academic Press)
[7] Sun T 2018 Balancing Innovation and Risks in Digital Financial Inclusion—Experiences of Ant Financial Services Group In Handbook of Blockchain Digital Finance and Inclusion 2 37-43
[8] Al-Amri K and Davydov Y 2016 Testing the effectiveness of ERM: Evidence from operational losses Journal of Economics and Business 87 70-82
[9] Chernobai A, Ozdagli A and Wang J 2020 Business complexity and risk management: Evidence from operational risk events in US bank holding companies Journal of Monetary Economics
[10] Wang Y, Li J and Zhu X 2017 A method of estimating operational risk: loss distribution approach with piecewise-defined frequency dependence Procedia computer science 122 261-268
[11] Carter R A, Antón A I, Dagnino A and Williams L 2001 Evolving beyond requirements creep: a risk-based evolutionary prototyping model Proceedings Fifth IEEE International Symposium on Requirements Engineering 94-101

[12] Laudon K C and Laudon J P 2014 Management Information System (13th-Global ed) (Harlow: Pearson Education Limited)

[13] Indonesian Financial Services Authority 2016 Peraturan Otoritas Jasa Keuangan nomor 65/POJK 03/2016 tentang Penerapan Manajemen Risiko bagi Bank Umum Syariah dan Unit Usaha Syariah