Assessing Leading ERP-SAP Implementation in Leading Firms in Indonesia

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Abstract. Enterprise resource planning (ERP) enables to bring critical capabilities to an organisation, however, the implementation of such capabilities is often surrounded with problems. The implementing ERP-SAP in Indonesian enterprises are still facing tremendous challenges with the failure rate can reach more than 80% of the cases. The article examines the common problems faced by the consultants whenever they deal with their clients, from the practical perspectives. The article takes the multiple case studies of the leading enterprises in Indonesia, such as: KS (largest steel producer), GEM (large mining producer), and HS (large retailer), with the aim to identify the root of problems of SAP implementation. The outcome of the study is expected to provide the consultants with the guideline to understand the ERP implementation process in their clients and effective solutions to cope with it.

1. Introduction
ERP system has been known as the most popular business management systems, that enables providing real-time benefits and seamless communication for business in large firms (1). An ERP system can integrate information used by accounting, manufacturing, distribution and human resources departments, etc. into a seamless computing system (2). However, due to its success, the ERP implementation still poses major challenges for Indonesian firms, where it has more than 80% failure rates (3). Wong and Tein (4) summarised the critical success factors for ERP projects such as: top management commitment and support; BPR; use project management to manage implementation; change management culture and program; clear goals, focus and scope (business plan and vision); selecting the right team (competence); customization avoidance; project champion; user training and education; effective communication; use of ERP’s consultants; vendor package selection; user participation; technical and business knowledge; integration of the system; appropriate management expectation; appropriate business and IT legacy systems; software development, testing and troubleshooting; vendor partnership; use of vendors’ development tools, monitoring and evaluation of performance; management structure, inter-departmental cooperation and communication.

The article takes the multiple case study method to examine the implementing ERP software, SAP that are used in the enterprise applications. The article examines the three leading enterprises in Indonesia, as comparison, such as: KS (largest steel producer/national strategic firm), GEM (subsidiary of national conglomerate in energy producer), and HS (subsidiary of largest retailer in Asia region). Those are the leading firms in their fields.

2. Theoretical Foundation
2.1. Factors that affect the ERP implementation
Implementing SAP involves complex process, since it requires very detailed work plans and schedules to ensure a smooth and well executed cross over. It also requires fundamental changes in technology, business process management and job functions, and they will not easily suits with the firm strategy and culture (5). To design an effective ERP system, it needs high-quality data, the notion of data quality should be well understood. Redman (6) states the impact of data quality covers the difficulty to establish and execute strategy, issues of data ownership, harder to align organisation, and distraction for management attention. It also hurts employee morale and increases organisational mistrust. Chung (7) recommends several measures to maximize ERP benefits, such as: (a) the firm should focus more on the quality and scope of the ERP system that matches with the firm’s needs. Well defined functions and the right software are mandatory, similar to increasing usefulness of the system; (b) a more realistic schedule
and budget should be planned to minimize the negative effects on the quality of the system. This method can satisfy the firm in both progress and quality of the ERP project; (c) choosing qualified consulting partners is required for ERP project success. They can lead the firm in the right direction in term of both progress and quality; (d) internal support is the main determinant of the progress of the ERP project such as: to complete the project on time with initial planned budget, top management support, training and good project planning are required during the ERP implementation. Timbrell (8) in his study found that major issue categories in SAP implementation comprised of: lack of organization-wide knowledge strategy; knowledge required to support and run SAP was not managed effectively; costs are too high compared to the benefits; customization and system integration; SAP system is inadequate or difficult to use; poor management of the implementation project and processes; organizational restructuring affected implementation efforts.

2.2. Data migration Process
Data migration process is the main focus of the ERP implementation. The common SAP implementation phase comprises of (9) (see figure 1): retrieving legacy data; data staging and test environment; loading; and loading in target environment.

![Figure 1. SAP rapid data migration solution architecture.](image)

The cost for data migration projects can summarised into: process, visibility, velocity, and accountability (10). Shatil and Tiwari (11) discovered that more than 80% of data migration projects run over time and/or cover budget, cost overrun average 30%, more than 75% of respondents experienced data management issue late in the project lifecycle. Russom (12) addressed the type of data-movement methods comprised of (13): use ETL-based tools for most data migration solutions; profile source data carefully; expect data migration like all variants of integration to expose data quality issues; use an interactive process to develop a data migration solution; allocate considerable time to modelling the target and mapping data to it; do not overlook stored procedures and other in-database procedural logic; decide what size and content of source data to test with; keep the project’s momentum rolling after deployment; expect that redundant instances of platforms will be required; and do not be in a hurry to unplug the legacy platform. The article examines the data migration process based on their capabilities (14): data source, data type, data reliability, interaction with other systems, and user access.

2.3. Knowledge Transfer
ERP systems can take benefit from knowledge management system (KMS) utilisation, including supporting the knowledge transfer in the implementation difficulties and managing system changes (15). Developing ERP systems requires that multiple users and developers to collaborate their implementation efforts, such as keeping a record of those problems, and to make sure the problems are addressed properly and solutions are found. Ko (16) addressed the important factors in knowledge transfer from consultants to clients such as: (a) shared understanding, allows them to effectively transfer knowledge, absorptive capacity and non-arduous relationship to minimize barriers in transfer knowledge. Identifying the individuals with similar work values, norms, and problem-solving approaches to work
with each other, firms can initiate activities.; (b) motivational factor, especially intrinsic values strongly
influences knowledge transfer in complex IS implementations; (c) communication factors influence the
transfer of ERP knowledge between consultants and clients both directly and indirectly. The ability to
express idea clearly and be easily understood by the client determines the successful transfer of ERP-
related knowledge; (d) Good business knowledge. consultant with a good knowledge of business and
understanding the thinking of business people, as well as general interpersonal skills.

2.3. ERP Testing methods
Gerrard (17) recommends the integrated set of test methods and tools is required to support the ERP
implementation as follows: (a) results-based management, modelling of results-chains to provide input
to a benefits-based test approach; (b) experience-based risk assessments that can provide input to a risk-
based test approach; (c) modelling of integrated user, automated and manual processes and interactions
in a format useful to testers; (d) derivation of objective, measurable and manageable test objectives from
these three models; (e) to integrate these three test objectives into a non-proprietary life-cycle test
methodology that can be managed systematically. Timbrell (8) emphasizes that SAP testing system is
one of the major issues that need to be addressed in SAP implementation, since it reflects the availability
and reliability of the entire ERP system.

The article takes the common crucial testing methods faced by the SAP consultants in the selected
firms such as (18): functional (check functionality of each desired module), integration (combining
multiple systems together to test output of integrated system), regression (testing full application/system
for modification), authorisation (identity test) and performance testing (check whether the system meets
the performance requirements).

2.4. Interface Integration with Legacy applications
Themistocleous et.al. (19) propose that enterprise architecture integration is summarised at 3 integration
layers such as: transportation layer, transfers the information from source application to integration
infrastructure and latter to the target application; transformation layer, translates the information from
source application format to target system structure; process automation layer, integrates the business
processes and controls the integration mechanism (see figure 2)

![Figure 2. Integration layers in ERP environment.](image)

The article examines the interface integration from the following factors (20): availability technology
and support, information system characteristics, system flexibility, ease of maintenance and control
access and data.

3. Methodology
3.1. SAP Accelerated Methodology
The three firms in the case study applies the SAP accelerated methodology comprised of several phases such as (21): project preparation; business blueprint (project preparation & refine goals); realization (implement system, test and configure); final preparation (system testing, end user training and fine tuning); Go-Live and support (move from pre-live to a live-operation, including end-user support).

3.2. Research method
The article applies the multiple-case studies for SAP-ERP implementation in the leading enterprises, that enables to examine the differences within and between cases (22) (23). The case study method involves using interviews and focus group meeting with the selected respondents. The objective is to replicate findings across cases with the purpose to forecast the similar results amongst SAP-based enterprises in Indonesia. The article applies the propositions as follows: (a) Proposition 1. Data migration process improves the ERP performance; (b) Proposition 2. Knowledge transfer mechanism improves the ERP performance; (c) Proposition 3. ERP testing methods improves the ERP performance; (d) Proposition 4. Interface integration with legacy methods improves the ERP performance.

3.3. Data gathering method
The questionnaires were designed with the Likert scale 1-5, and distributed to 118 respondents in those three enterprises, comprised of: 92 males (81.36%) and 22 Females (18.64%). The interviews and focus group also had been conducted to the selected respondents to explore their thoughts and data findings. The majority of the respondents age were below 30 years, with minimum education background bachelor or above. The distribution of respondents is shown in Table 1 below.

Table 1. Distribution the respondents

| No. | Respondents | KS | GEM | HS | Total | percentage (%) |
|-----|-------------|----|-----|----|-------|----------------|
| 1   | Age:        |    |     |    |       |                |
|     | < 30 yrs    | 48 | 19  | 5  | 72    | 61.02%         |
|     | 31 - 40 yrs | 9  | 15  | 5  | 29    | 24.57%         |
|     | 41 - 50 yrs | 8  | 1   | 6  | 15    | 12.71%         |
|     | > 50 yrs    | 2  | 0   | 0  | 2     | 1.70%          |
| 2   | Education:  |    |     |    |       |                |
|     | High School | 4  | 0   | 1  | 5     | 4.24%          |
|     | Vocational  | 6  | 1   | 4  | 11    | 9.32%          |
|     | Bachelor    | 52 | 28  | 8  | 88    | 74.58%         |
|     | Post Graduate| 5  | 6   | 3  | 14    | 11.86%         |

| No. | Respondents | KS | GEM | HS | Total | percentage (%) |
|-----|-------------|----|-----|----|-------|----------------|
| 3   | Working Exp:|    |     |    |       |                |
|     | < 3 yrs     | 32 | 20  | 6  | 58    | 49.15%         |
|     | 3 - 5 yrs.  | 21 | 12  | 4  | 37    | 31.36%         |
|     | 6 - 10 yrs. | 6  | 3   | 4  | 13    | 11.02%         |
|     | > 10 yrs.   | 8  | 0   | 2  | 10    | 8.47%          |
| 4   | Title:      |    |     |    |       |                |
|     | Staff (Analyst) | 37 | 33  | 15 | 85    | 72.03%         |
|     | Consultant  | 26 | 0   | 0  | 26    | 22.03%         |
|     | ERP PM      | 2  | 1   | 1  | 4     | 3.39%          |
|     | Head of Department | 2 | 1   | 0  | 3     | 2.54%          |

4. Case Study
4.1. Overview Enterprise
KS is one of the largest steel producer in Indonesia, and national strategic enterprises. KS has shown a significant progress with the addition of a number of production facilities such as: sponge iron plant, steel billet plant, wire rod plant, as well as the supporting infrastructure including power plant generator, water treatment plant, ports and telecommunication system. KS serves the steel demands both domestically and international markets. In domestic market, KS also serves the defence industry. Since 1995, KS has implemented the SAP R/3 modules such as: FICO (Financial Controlling), SD (Sales and Distribution), HR (Human Resources), PSIM (Project System & Investment Management), MM (Material Management), QM (Quality Management), PM (Plant Maintenance), PP (Production Planning), and XI (Xchange Interface).

GEM is engaged in the business of trading sector of mining products and mining services. GEM was awarded as one of the 50 firms with the best Good Corporate Governance by Indonesian Institute for Corporate Directorship (IICD) for the last 3 years in 2015. Since 2010, GEM has implemented SAP modules such as: FICO (Financial Controlling), MM (Material Management), SD (Sales and Distribution), and PP (Production Planning). GEM and its subsidiaries operate large mining fields in Jambi and Borneo (Kalimantan).
HS is a subsidiary of largest retailer in Asia region with more than 700 stores in Indonesia. HS has subsidiaries such as supermarkets, health and beauty stores, convenience stores, and mini markets. HS group receives the 7th IICD Corporate Governance Conference and Award (Top 50 Public Listed Companies), community care firm of the year 2015, Asian version Corporate Excellence and Sustainability award (ACES). Since 2010, HS has implemented SAP modules such as: FI (Financial), ME (Merchandise), ME (Merchandising) and RL (retail).

4.2. Findings and Analysis: Technical Perspectives

After the implementation, the questionnaires were distributed to all respondents with the following results:

| Parameters                     | KS     | GEM    | HS     |
|--------------------------------|--------|--------|--------|
| 1. Data Migration              | 4.30   | 4.15   | 4.26   |
| 2. Knowledge transfer          | 4.29   | 4.07   | 4.36   |
| 3. ERP testing methods         | 4.39   | 4.22   | 4.49   |
| 4. Interface integration       | 4.25   | 4.14   | 4.51   |

The results above show that all respondents are quite happy with the implementation. The interviews and focus groups were conducted to explore these results, with the representative from staffs, consultants, PM, and head of departments with the findings are shown as follows (see Table 3):

- Data migration process, dominated with data management (24) and technical expertise of project manager (PM) and team. The data management problem (25) was inherited within the organisational immaturity related to ERP implementation. Consultants and PM don’t realise the organisation immaturity is the root cause of the communication struggle that affect to creating information quality and technical expertise associated with it (26). The business and IT managers need to understand there is urgency to revising the cultural issues in order to support data migration process.

- Knowledge Transfer, dominated with crucial share understanding between users and consultants, in developing appropriate KMS that supports the application of BPR (27), the need of KMS to identify critical knowledge, manage collection, storage and organisation those knowledge, solution manual facilitates communication, and developing good business/technical knowledge. ERP implementation should be understood from the perspective of the entire organization with its environment, and not just a software installation ERP (28).

- Testing methods, dominated with the need of early introduction BPR change initiative (29) and Test plan. Data findings show that both BPR initiative and Test plan are highly related each other and affects the entire ERP implementation process. Organisational strategies are needed in testing methods and quality assurance to assist the synchronisation organizational needs in ERP systems implementation and also increasing user acceptance (30).

- Interface integration, dominated with BPR efforts, supports of top management (28), and having good of technical knowledge (related to cost effective solutions).
**Table 3. Summary Issues related to the Interviews and Focus Group.**

| No | Critical points in | KS                          | GEM                                      | HS                                      | Key Factors to highlight |
|----|-------------------|-----------------------------|------------------------------------------|-----------------------------------------|--------------------------|
| 1  | Data Migration Process | Different type and data format, has delayed the data mapping (from legacy to new system) | Hierarchy of data approval takes times (bureaucracy of approval) | Large volume of data in legacy system, and it requires separate team to manage it. | Data management is often under-estimated and not understood properly. |
|    |                    | Inadequate current software tools, so it requires additional tools to conduct data transfer. | Frequent data revision supplied by users, and data needs frequent validation. | Data validation needs frequent confirmation from other departments/business groups. | Expertise of PM is required to ensure the end-to-end data management runs smooth (31). |
|    |                    | KS has defined the ERP-integrated architecture vision, however, there is a gap in developing shared-understanding between senior | Consultant did not develop adequate shared understanding with the users, and it affects the entire modules implementations. | Consultant and HQ technicians have lack of shared understanding with the local users in developing applications. Any urgent change problem cannot taken care immediately. | Share understanding plays important roles in transferring important knowledge from consultants to users and vice-versa (32). |
| 2  | Knowledge Transfer | Lack of encouragement to use KMS | No KMS is available for storage purpose, such as: SAP documentation related to change program. | KMS is only used for documentation purpose, such as: SAP documentation related to change program. | KMS enables to facilitate BPR, along with SAP implementation (31). |
|    |                    | Solution manual is not applied effectively; it is used more as directory of documentation. | Solution manual has not yet been implemented. | Solution manual is used in a workflow of transport change request. | Solution manual enables to facilitate communication between users and consultant. |
|    |                    | There are always unexpected things required by the users or top management (beyond initial plan), i.e. additional dual currency issues (FICO). | Multiple roles of PM, GEM require the task of PM should be ready for all projects associated with SAP applications. | PM should develop adequate knowledge related to retail business. Current PM has high dependency on the knowledge of key user in each department. | Having good business knowledge related to business process and nature of the firm will help the PM completes his/her tasks effectively (31). |
|    |                    | Slow hierarchical approval for fixing the defect applications that prolong the testing phase. It delivers impacts to the next business process. | Unreliable testing facilities such as availability of robust servers delay testing activities, i.e. Development server experiences frequent downtime. | Testing server for QA has different data format compared to the ones stored in the production server, so it delays the testing process. | BPR and Test plan should be introduced far earlier. Lack of these preparation delays the entire testing process and creates hidden problems in the future. |
|    |                    | Lack of BPR efforts has been the major challenges in interface integration, i.e. it delayed the MES (legacy apps) and SAP system integration to several years ahead. Initiating the BPR efforts requires relentless efforts. | Firm has complete licenses for all SAP modules, however, the integration with legacy applications still runs slow due to technical expertise. Major legacy applications are left stand-alone. | Cost saving and lack of focus are the major issues in performing interface integration. Staffs need to figure out the most cost effective way to integrate the legacy apps in the SAP environments, and they are required be able to | BPR efforts, supports of top management and Having good technical knowledge (middleware technologies) are crucial for interface integration (33). |
Table 3. Summary Issues related to the Interviews and Focus Group (continued).

| No | Critical points in | KS | GEM | HS | Key Factors to highlight |
|----|-------------------|----|-----|----|--------------------------|
|    |                   |    |     |    | run both legacy and SAP systems smoothly. |
| 3  | ERP Testing methods | Slow hierarchical approval for fixing the defect applications prolong the testing phase and delivers impacts to the next phase. | Unreliable testing facilities delays testing activities, ie. Development server experiences frequent downtime. | Testing server (QA) has different data format compared to the ones stored in the production server, so it delays the testing process. | BPR and Test plan should be introduced far earlier. Lack of these preparation creates hidden domino effects (problems) in the implementation (34). |
| 4  | Interface Integration | Lack of BPR efforts has been the major challenges in interface integration, it delayed integration efforts (MES-SAP) to several years ahead. Initiating the BPR efforts requires relentless efforts. | Firm has complete licenses for all SAP modules, however, the integration with legacy applications still runs slow due to lack of technical expertise. Major legacy applications are left stand-alone. | Cost saving and lack of focus are the major issues in performing interface integration. Staffs need to figure out the most cost effective way to integrate and manage the legacy apps in the SAP environments. | BPR efforts, supports of top management and having good technical knowledge (middleware technologies) (13) are crucial for interface integration (34) (33). |

5. Lessons Learned
The successful ERP project depends on clear and change managed objectives (such as BPR initiative and cultural issues), an attention to risk management and the monitoring of data quality (data migration process), schedule (knowledge transfer) and cost-effective solution (interface integration). Successful PM should develop the necessary knowledge that enables to manage the (technical integration) achievements (31), not activities. It infers that project deliverables should be monitored, rather than the completion status of activities. It includes organization preparation (includes top management supports, BPR, developing appropriate KMS tools), user issues (knowledge transfer), change management (data migration and interface integration), as well as testing plan and QA (17).

6. Summary
The multiple case studies have been presented to examine the common problems faced by the consultants related to: data migration process, knowledge transfer, testing methods, and interface integration. The foundation problems beneath these factors such as: introducing the change management, BPR initiative and test plan as early as possible, developing appropriate KMS that enables knowledge transfer, top management supports and developing good business and technical knowledge.

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