



Organizational Dynamics in Shared IT Leadership at Coal Mining Industry: A Case Study

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Abstract— The mining industry has faced intense challenges and disruptions from global trends. The mining industry needs to perform a transformation to survive. The important thing for mining companies in technological adoption is digital transformation. XYZ is a holding company with many subsidiaries with primary businesses in the coal mining sector spread throughout Indonesia. As part of digital transformation, one of the company's initiatives is to centralize IT resources into one organization, with the objective can share its utilization with all subsidiaries. IT's centralization and shared services caused problems, such as human resources in different company ownership, budget allocation among companies, and the structure of financing and utilization of IT resources for use. The problem was solved by mapping all the components' IT roles at the company based on the framework created by Applegate, Austin, and Soule. Mapping the role of IT in this company can be used as a guideline to make organizational change. Organizational changes that need to be done base on analysis is to change the structure of the organization of IT into a bimodal model, its combination between the Functional-Lean model and Matrix-Agile model. The Functional-Lean model provides organizations as a function to keep lean but can deliver high standard services and keep it stable. The Matrix-Agile model can provide agility for the organization to develop new and run projects. IT Governance at XYZ will use the Federal model.

Keywords— Organization dynamics; IT leadership; IT role; share service; bimodal; IT agile; IT lean.

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I. INTRODUCTION

The mining industry has faced intense challenges since the explosion of a mining commodity that culminated in 2011 [1]. World Economic Forum [1] explained that these challenges are (a) weak global demand, (b) excessive capacity, (c) increasing consumer requirements, (d) trade flow disruptions, (e) growing resource nationalism and regulation, (f) widening the workforce skill gaps, and (g) declining resource access and quality. These challenges occur due to changing trends such as (a) a revolution in electricity sources that use renewable resources and (b) the awareness that fossil energy has terrible consequences for the environment [2]. The challenges have led the mining companies to make changes in organizations to (a) align strategies and operations toward innovation, (b) look outside the current business, (c) improve data access and relevance, (d) engage and train future digital workforce, (e) invest in alternative benefits, and (f) strengthen the partnerships [1], everything mentioned above will cause all companies in the mining industry will change the way in adopt

and utilize the technology to survive, and force them to transform the business landscape.

The first thing that has to be done for mining companies in technological adoption is digital transformation. Digital transformation is a technology that can control the process [3]. Digital transformation is enhanced by three things that are (a) big data, (b) connectivity, and (c) technology-based for decision making [3]. This transformation requires the role of IT to support the direction and strategy of the company.

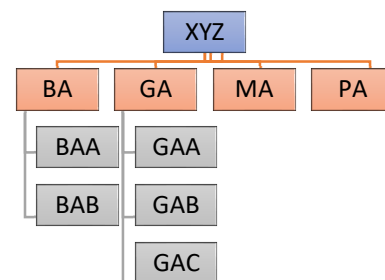


Fig. 1 Level of company in XYZ

XYZ is a holding company with many subsidiaries spread throughout Indonesia with primary businesses in the coal mining sector. Fig. 1 shows the level of the company in XYZ. The existence of companies under XYZ as separate business entities require reliable coordination and utilization of IT. Initially, the subsidiaries had separate and indivisible IT functions. This condition made XYZ takes the initiative to do resource efficiency by merging all IT functions.

Centralization is one of the initiatives chosen to efficiently merge IT resources into one organization in the holding company to share its utilization among all subsidiaries. A CIO currently heads this centralized organization, but each subsidiary still has a different CEO, CFO, and COO. (Fig. 2). This centralization operation has faced many problems, such as (a) human resources with separate company ownership, (b) inter-company budget allocation, (c) financing structure, and (d) utilization of resources, which made IT services as constrains.

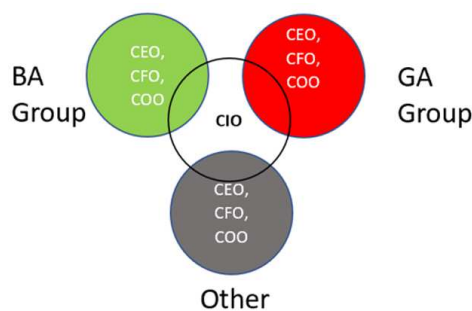


Fig. 2 CIO role at XYZ

Conditions caused are needed specific action by the company to make its service can still well delivered. What is the best IT organization strategy for companies that share IT services with many subsidiaries in roles, leadership, and organization structures? Therefore, this article will focus on how the company can have a suitable organizational form.

II. MATERIAL AND METHOD

A. Role IT

IT role in an organization can strongly influence the company to identify opportunities, design, and implement IT-enabled business initiatives and manage resources [4]. The role of IT in an organization can be divided into two main dimensions related to the company business implications (a) the application portfolio and (b) the project portfolio [4]. Applegate, Austin, dan Soule [4] divide the role of IT into four types is (a) support, (b) factory, (c) turnaround, and (d) strategic. Support is the most fundamental role when the organization is less dependent on IT functions. The factory is an IT role, which is critical for today's business operations. Turnaround is an IT role that enables digital transformation and is an experimental effort to produce more strategic IT functions in the future. The Strategic is a crucial role of IT for today's business operations and possible future transformations.

B. Transition and IT Leadership

A company's external and internal aspects can change the IT role [4], [5]. The transition of the IT position leads to

tensions, and these issues should be resolved. To ensure that organizational goals can still be achieved. Applegate, Austin, dan Soule [4] divides the management of tension in the changing role of IT into two aspects, (a) Managing the execution-innovation tension, (b) managing the IT-business relationship. The leadership will have different approaches depending on the IT role type that exists in the organization. The support role requires organizing IT with a low-cost approach and incremental improvement. The position of the factory requires an IT organization for operational efficiency and reliability. Turnaround roles require IT organizations to undertake the experiment and the rapid exploitation of IT functions. Strategic positions require IT roles to apply operation discipline and business agility.

C. IT Organization

IT organization is a unit of people who perform the IT functions of (a) infrastructure and operations and (b) build and run its internal systems [6]. To run all those functions, Narayan [6] mentioned that IT could apply principles of bimodal IT to run the organization, that is:

- *Business-as-usual IT organization.* This organization aims to maintain core business by providing services that are (a) predictable, (b) change controlled, and (c) cost-efficient.
- *High-speed IT organization.* This organization aims to *design* and implement corporate strategies by providing (a) fast and (b) relevant to the changing market and technological landscape.

Organizational transformation is the way for companies to stay relevant and survive in running their business. Transformation can be carried out in two IT organizations' speed mode; (a) shift to a business-as-usual organization can take advantage of the lean paradigm and (b) transform in high-speed organizations can take advantage of the agile paradigm.

The lean paradigm in IT is the capability of IT people to provide services that can improve (a) customer satisfaction, (b) strategic advantage, (c) and cost advantage for a company According to Loader[7], a lean paradigm based on the rules:

- Reduce waste in processes to increase value.
- Optimum utilization of limited resources.
- Continue improvement from defect experience.

The agile paradigm in IT is the capability of IT people to provide services to the company with (a) value-oriented versus predictable things, (b) responsive action versus cost efficiency, and (c) intrinsic motivation versus extrinsic motivation [6]. According to Narayan [6], an agile paradigm is:

- Cross-functional groups to focus on results as added value for consumers.
- Results-oriented rather than focus on activities.
- Utilize share services.
- Matrix organization model to accommodate the project and business needs.

D. Theoretical Framework

This case study will be based on IT's role and leadership, and the result will elaborate into the organizational form [4]. The organization's proposed model is bimodal [6], [8], consisting of Lean [7] and an Agile organization [6]. Figure 3 shows the theoretical framework used in this case study.

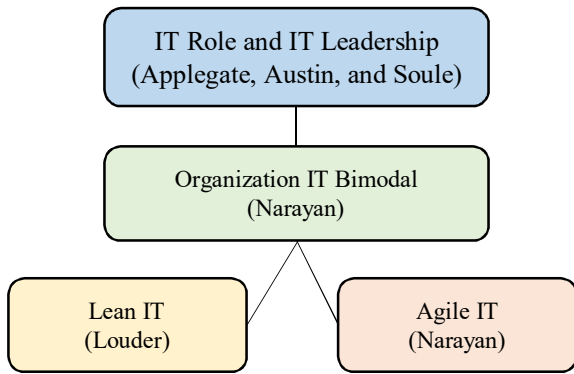


Fig. 3 Theoretical framework

E. Methodology

This research begins by identifying problems in XYZ and then searching for relevant literature. The problem statement will arise from the identification results. Then the IT role will be measured for each subsidiary. Measurement will refer to the method developed by Applegate, Austin, and Soule [4]. Measurement is made to all the IT managers or supervisors, depending on which one was higher in respective subsidiaries.

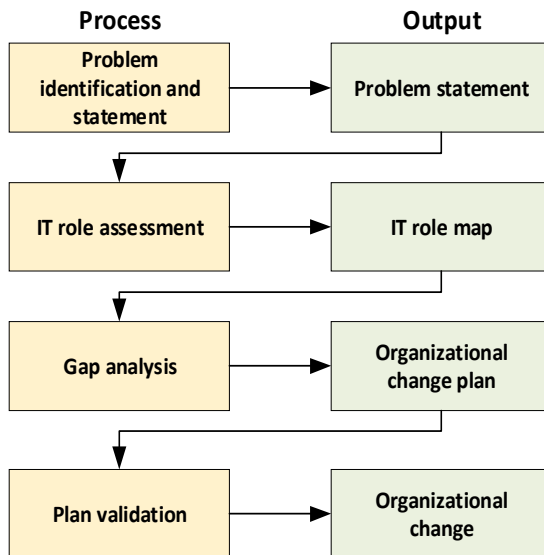


Fig. 4 Research methodology

The results are mapped into quadrants that describe the current and targeted roles. The next step is to conduct a gap analysis that aims to identify weaknesses and recommendations for what actions to be taken. All those recommendations plans must describe and submitted to management for approval and validation. **Error! Reference source not found.** shows the methodology used in this case study.

Applegate, Austin, dan Soule framework [4] suggests us to identify IT role based on ten leadership implications in each IT aspect, (a) time horizons, (b) business focus of IT, (c) key business challenges, (d) key technical challenges, (e) organizational and management approach, (f) profit impact of IT functions, (g) IT leader attributes, (h) managerial talent approach, (i) corporate improvement, and (j) selection of performance measures. Measurements were made by making questions with the YNNA scale, consisting of Yes, No, and N/A. The YNNA scale can be translated into Yes = 1, No = 0, and N/A is not counted. The position of the IT role is taken from the highest score in the aggregate rating of the YNNA scale. The measurement calculation is based on the following formula:

$$r = \frac{\sum y}{\sum y + \sum n} \quad (1)$$

r = result; y = question with answer "Yes"; n = question with answer "No".

III. RESULT AND DISCUSSION

A. Measurement Result

The result of this assessment is presented by a heat map shown in TABLE . The red color in that heatmap means 0%, while yellow is 50%, and green is 100%. Applegate, Austin, dan Soule [4] describes that the pattern of the direction for transition should starts from (a) support to factory or strategic, (b) support to turnaround or strategic, (c) factory to strategic, and (d) turnaround to strategic. Looking at the map of the IT role in XYZ subsidiaries (Fig. 5) shows that the support role is the most dominant. It also can be concluded that the parent company has a strategic position, but mostly the subsidiary is still in the support and factory-turnaround categories. The gap between the parent company and its subsidiaries requires improvement to achieve the direction to be a strategic role.

TABLE I
IT ROLE ASSESSMENT RESULT

IT Role	XYZ	BAA	BAB	GAA	GAB	GAC	MA	MP
Support	68%	62%	67%	68%	60%	68%	67%	78%
Factory	63%	69%	16%	13%	50%	13%	13%	16%
Turnaround	71%	66%	9%	9%	57%	9%	9%	9%
Strategic	76%	12%	6%	6%	9%	6%	6%	6%
Assessment result	Strategic	Factory-Turnaround	Support	Support	Factory-Turnaround	Support	Support	Support

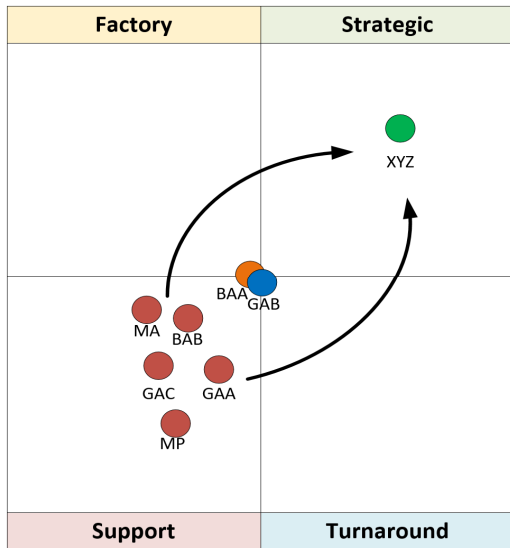


Fig. 5 Mapping IT role at XYZ

B. Gap Analysis and Change

A gap analysis was carried out by comparing the target's current conditions to a strategic role using the Applegate, Austin, and Soule framework [4]. The gaps and all recommendations for the change plan are described in TABLE II.

TABLE II
GAP AND CHANGE PLAN

Aspect	Gap	Change Plan
Operation and Infrastructure Services	Partially Centralized	Move all services to be full centralized
Project and Infrastructure Development	Partially Centralized	Change IT organization matrix for infrastructure projects and development.
Organizational and management approach, Leadership	Mixed	Clear segregation between functional and operation
	Mixed	Functional Division direct report to CIO. Operational Division as structural will report to subsidiaries management but still under CIO coordination.
Human Resources	Spread/different cost center	Divided into two structures, organizations are lean and agile. The lean structure will be at the holding company, and the Agile structure will be at subsidiaries.

C. Change in IT organization

Future changes in IT organizational structure will be divided into three groups, consist of (a) project and development, (b) operations, and (c) supply chain management. The CIO's role is (a) to coordinate all IT needs and synergize with other C-Levels in all subsidiaries and (b) to manage and control all specific resources at respective subsidiaries [9]. The subsidiaries' IT function will be

centralized into one committee to ensure coordination and tasks can equally distribute and complement each other.

The project and development section will be responsible for managing the project and developing the subsidiary's IT infrastructure. All project management will be controlled by the PMO (Project Management Office) and managed according to the project management framework. Each project must be based on an agile paradigm, which can take one of the agile development frameworks, for example, Scrum [10], [11], XP [12], or TDD [13], [14].

The operational section has the responsibility to keep daily services stable and reliable. This section divides into two subsections (a) an application sub-section was responsible for ensuring that the application services run stable and reliable, and (b) an infrastructure sub-section has responsibility for all IT infrastructure operations and daily support services. The supply management section has responsibility for managing procurement and administration at all subsidiaries. This section aims to get visibility of all IT needs to maximize and avoid overlapping at similar services. This section also focuses on maintaining and managing the level of service from third parties.

The entire IT organization is designed to become bimodal IT [8], [15], an organization that applied a lean functional paradigm at the holding while agile matrix paradigm at subsidiaries. The concept of integration between project development and operation section is carried out with a DevOps mindset [16]. This mindset is selected because it can synchronize all sections in good communication and coordination. Kim *et al.* [17] argue that organizations that run agile and lean systems can apply the DevOps mindset. Fig. 6 shows the new organizational structure.

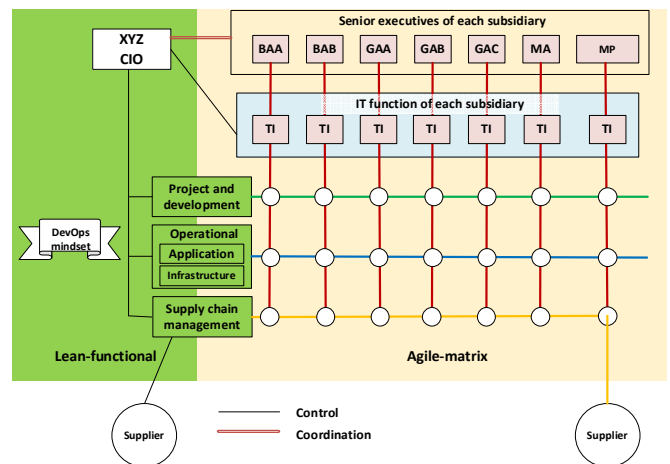


Fig. 6 New IT organization structure in XYZ.

The suitable IT governance for XYZ is the federal model [18], it's a hybrid governance concept between a centralized and distributed model. The federal model allows the corporate strategy to work parallel with specific components at the subsidiary. However, the federal model has a disadvantage, such as powerful subsidiaries will get more attention and influence than smaller subsidiaries [19]. This weakness can be mitigated by implementing a joint committee consisting of the CIO, Subsidiary C-Level, and IT representatives to set up the priorities to be financed and implemented.

A functional organization is an organization type designated based on its function [20]. This organization makes similar procedural and hierarchical functions into a single section [20]. This type can increase flexibility and knowledge and reduce duplication [21]. However, this type of organization will be less agile when facing rapid changes [21]. The matrix organization is designed for agility[22]. This type can make it easier for the organization to deal with rapid change. This organization type is also created for an organization to have fast coordination between divisions when problems occur, and when sources of information are not close to decision-makers [21]. However, this type of organization also has a high possibility of conflict and low response time [21]. In this case, the recommendation is to use the bimodal TI as an organization model for IT at XYZ with a combination model between Function-Lean and Matrix-Agile. The Functional-Lean model provides organizations as a function to keep lean but can deliver high standard services and keep it stable. The Matrix-Agile model can provide agility for the organization to develop new and run projects.

IV. CONCLUSION

Changes in the organizational model due to IT's changes and the external factors of the business environment require strong IT leadership. There are three organizational clusters obtained from the assessment using the Applegate, Austin, and Soule framework[4]. There are gaps between the clusters that need to be resolve from an organizational perspective. This study suggests that the organizational structure should change to the Bimodal IT Model with a combination model between Function-Lean and Matrix-Agile. The limitation of the study is conducted within a certain period. The research results are only on the organizational structure model changes. Future research can examine the effects of changes in this organization model over time through a longitudinal study. Further research can also investigate the IT business transformation model to support the company strategy.

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