

BUSINESS PROCESS DESIGN FOR ENGINEER COMPETENCY MANAGEMENT THROUGH CERTIFICATION AND CAPACITY BUILDING ENHANCEMENT

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Abstract

This study aims to design a business process for managing engineer competencies through certification and to improve the effectiveness of monitoring and evaluation of capacity building in partnership programs at PT XZY. The method used is a qualitative approach through desk study, interviews, and focus group discussions (FGD) with key stakeholders, which are then analyzed using root cause analysis (5-Why). The results indicate that the management of engineer competencies is not yet optimal, as evidenced by the absence of integrated policies related to certification, the mismatch between competencies and roles, and weak monitoring and evaluation systems. In addition, scattered and non-integrated competency data leads to inefficiencies in planning and fulfilling resource requirements for projects. As a solution, this study proposes a structured business process design, including role-based certification management, integration of competency data, and strengthening of monitoring and evaluation systems. The implementation of this design is expected to enhance the effectiveness of resource planning, reduce organizational cultural entropy, and support the achievement of the company's vision as Indonesia's World Class Engineering Champion.

Keywords: competency management, engineer certification, business process, capacity building, monitoring and evaluation

INTRODUCTION

PT XYZ, as the engineering consulting company, which is required to transform into Indonesia's World Class Engineering Champion through various strategic initiatives and shall be in line with the parent entity's vision, that become a Global Top 500 company and the preferred choice for energy solutions. One of the strategies is the strengthening of the Engineering Capabilities. In this context, PT XYZ's role is not only as an engineering service provider but also as a value guard entity in ensuring quality, efficiency, and timely execution of projects within the Holding Group.

However, the significant increase in performance targets, such as EBITDA growth and improvement in On Time Delivery (OTD), accompanied by a surge in the number of projects to be handled, demands the readiness of competent and adaptive human resources. Recent studies emphasize that human capital and competency alignment play a critical role in improving organizational performance, particularly in project-based environments (Cascio & Boudreau, 2016; World Economic Forum, 2020; PMI, 2021). On the other hand, internal evaluations indicate an increasing trend in organizational cultural entropy, which reflects rising inefficiencies, conflicts, and frictions within work processes (Barrett, 2017). This condition has the potential to reduce organizational effectiveness, particularly in managing engineering resources as the company's primary asset.

Based on fact-finding activities through interviews and focus group discussions (FGD), several key issues have been identified, including suboptimal management of engineer competencies, mismatch between competencies and roles, weak monitoring and evaluation systems, and the lack of integrated competency data at the corporate level. These findings are consistent with more recent studies indicating that fragmented competency systems lead to inefficiencies in workforce planning and performance outcomes (Campion et al., 2020).

Furthermore, the absence of comprehensive policies governing engineer certification has been identified as the root cause affecting the effectiveness of workforce planning and resource fulfillment in projects. Effective competency management requires integration with business processes to ensure alignment between organizational needs and workforce capabilities (Dumas et al., 2018; vom Brocke & Mendling, 2018).

This study aims to design a business process for managing engineer competencies through a role-based certification approach, as well as to improve the monitoring and evaluation processes of capacity building within partnership programs. The contribution of this study is expected to provide added value both theoretically and practically, particularly in developing a structured and integrated business process model for competency management.

The novelty of this study lies in the integration of engineer certification management with business process design and structured monitoring and evaluation systems, thereby supporting overall organizational effectiveness. In addition, this study offers practical implications in the form of recommendations for implementing a competency management system that supports project-based workforce planning and reduces organizational cultural entropy.

The scope of this study focuses on analyzing existing conditions, identifying root causes, and designing solutions in the form of a business process for managing engineer competencies and improving monitoring and evaluation systems for capacity building within PT XYZ.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Concept of Competency Management

Competency management is a systematic process of identifying, developing, and ensuring the alignment of human resource competencies with organizational needs. Competencies include knowledge, skills, and behaviors required to achieve optimal performance (Campion et al., 2020). In project-based organizations such as engineering firms, competency management plays a critical role in ensuring effective and efficient project execution (PMI, 2021). Modern competency management models emphasize the integration of organizational needs, job roles, and continuous individual development (Cascio & Boudreau, 2016; World Economic Forum, 2020).

Engineer Certification as a Competency Standard

Engineer certification is a formal recognition of individual competencies based on established standards. Certification not only validates technical capabilities but also ensures alignment between competencies and job requirements (Cascio & Boudreau, 2016). In engineering organizations, certification is essential for enhancing credibility, improving work quality, and strengthening organizational competitiveness. Furthermore, certification supports structured and competency-based workforce planning (Campion et al., 2020; PMI, 2021).

Business Processes in Human Resource Management

Business processes refer to structured and integrated activities designed to achieve organizational objectives. In human resource management, effective business processes include workforce planning, competency development, resource allocation, and performance monitoring and evaluation. The absence of integrated business processes can lead to inefficiencies, duplication of work, and misalignment between organizational needs and available competencies (Dumas et al., 2018; vom Brocke & Mendling, 2018). Therefore, integrating business processes with human

resource management is essential to improving organizational performance and operational efficiency (Brocke et al., 2021).

Monitoring and Evaluation in Capacity Building

Monitoring and evaluation are critical components in ensuring the effectiveness of competency development programs. Monitoring involves continuous oversight of program implementation, while evaluation assesses outcomes against predefined objectives. In the context of capacity building, well-structured monitoring and evaluation systems help organizations identify competency gaps, assess training effectiveness, and determine appropriate development strategies (Nudurupati et al., 2021; OECD, 2020). These processes also support continuous organizational learning and performance improvement in dynamic environments (Cascio & Boudreau, 2016).

Cultural Entropy in Organizations

Cultural entropy refers to the level of energy wasted within an organization due to conflicts, friction, and inefficiencies in work processes. High levels of cultural entropy indicate issues in organizational governance, communication, and leadership (Barrett, 2017). In knowledge-based organizations such as engineering firms, increased cultural entropy can significantly affect productivity and performance quality. Therefore, improving systems and business processes, including competency management, is a key strategy to reduce cultural entropy and enhance organizational effectiveness.

RESEARCH METHODS

This study uses a qualitative research approach with a field study method to obtain an in-depth understanding of engineer competency management within PT XZY. Qualitative research is considered an appropriate approach as it allows researchers to explore complex organizational processes and identify underlying problems in a real-life context. The purpose of this study is to provide a systematic, factual, and accurate description of competency management practices and to develop an improved business process design through engineer certification and enhancement of monitoring and evaluation in capacity building programs.

The data sources used in this study consist of primary and secondary data. Primary data are obtained through direct interviews with relevant stakeholders involved in competency management and project execution within PT XZY. These include Project Team Leaders (PTL), engineers, and representatives from related functional units. Secondary data are obtained from internal documents such as policies, procedures, competency data, certification records, project performance reports, as well as relevant literature including journals and previous studies related to competency management and business processes.

Data collection in this study is conducted using several techniques. First, a desk study is carried out to review organizational documents and understand existing processes. Second, semi-structured interviews are conducted to explore participants' perspectives regarding current practices, challenges, and needs in competency management. Third, Focus Group Discussions (FGD) are conducted to validate findings, identify common issues, and collaboratively develop potential solutions. These approaches enable the researcher to gather comprehensive and in-depth information.

The data collected are analyzed using qualitative analysis techniques. The analysis begins with descriptive analysis to describe the current condition of competency management. This is followed by Root Cause Analysis (RCA) using the 5-Why method to identify underlying problems. Based on these analyses, a business process design is developed to provide a more structured and integrated model for competency management.

The study is conducted at PT XZY, with data collection carried out over a specific period using both online and offline methods, depending on the availability of respondents. To ensure the

validity and reliability of the research, triangulation methods are applied, including data triangulation, method triangulation, and confirmation of findings through discussions with informants

RESULTS AND DISCUSSION

Existing Condition of Engineer Competency Management

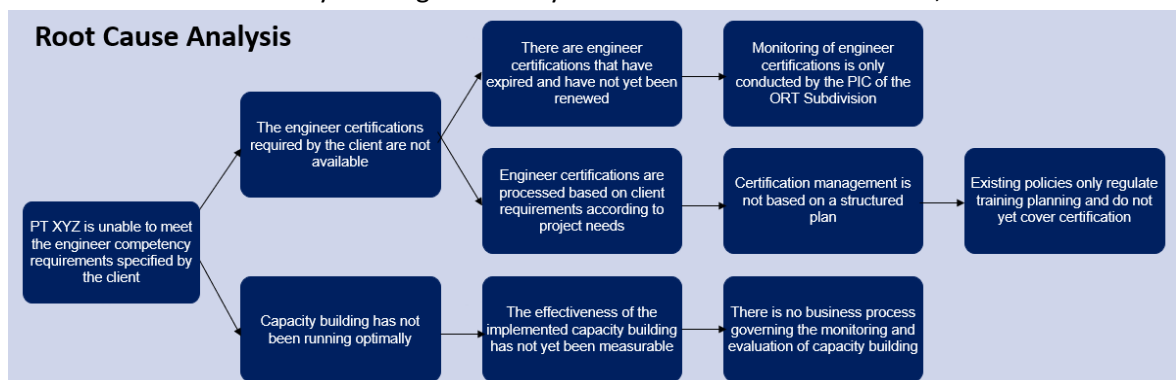
The findings indicate that the current engineer competency management at PT XYZ is not yet optimal. Based on interviews and focus group discussions (FGD), several key issues were identified.

- Competency data are fragmented and not integrated, resulting in multiple versions of data across units. This condition leads to inefficiencies in workforce planning and difficulties in identifying competency gaps.
- Second, there is a mismatch between engineer competencies and assigned roles, which affects project performance. Some engineers are assigned to roles that do not align with their certification or expertise, while others lack the required competencies for specific project demands.
- Third, the monitoring and evaluation of competency development programs are still not optimal. Existing processes are not supported by structured mechanisms, making it difficult to assess the effectiveness of capacity building programs.
- Fourth, the absence of a comprehensive policy governing engineer certification has resulted in inconsistent certification management, including expired certifications and the lack of systematic renewal processes.

These findings indicate that the current competency management system is not yet able to support the increasing organizational demands, particularly in handling the growing number of projects and higher performance targets.

Root Cause Analysis

The root cause analysis using the 5-Why method is described as follows,



Source: Findings based on interviews and focus group discussions (FGD) with Project Team Leaders (PTL), Engineers, and representatives from relevant functional units at PT XYZ (2026)

Figure 1. 5-Why Analysis Results

Based on the analysis conducted, several causes/issues were identified, which ultimately converge into a primary root cause related to engineer competency management, namely the absence of policies governing engineer certification.

Based on the results of data collection (*fact finding*) that has been carried out, followed by the analysis of root causes (*Root Cause Analysis*), a common thread can be drawn leading to the identified problem statement, namely the suboptimal Business Process of Engineer Competency

Management to support PT XZY's vision of becoming *Indonesia's World Class Engineering Champion*.

Business Process Design for Competency Management

To address the identified gaps, this study proposes a structured and integrated business process design for competency management. This approach is aligned with the concept of Business Process Management (BPM), which emphasizes the importance of aligning business processes with organizational objectives to improve efficiency and performance (Van Looy, 2016). Furthermore, the integration of competency management within business processes is supported by the competency-based management approach, which positions competencies as a key element in enhancing organizational performance (Khairunnisa, 2026).

To address the identified gaps, this study proposes a business process design for competency management consisting of the following components:

a. Competency Mapping and Role Alignment

Competency mapping is the process of identifying key competencies required for each job role to achieve optimal performance. This process enables organizations to define competency requirements more precisely and ensure alignment between individual capabilities and job responsibilities.

Through effective competency mapping, organizations are able to improve the accuracy of workforce placement, ensuring that the right individuals are assigned to the right roles. This alignment enhances productivity, reduces inefficiencies caused by skill mismatches, and supports more effective workforce planning. In addition, competency mapping helps organizations systematically identify training needs, enabling targeted capacity building programs that directly address competency gaps.

Furthermore, the implementation of competency mapping contributes to improved project performance, as personnel are better equipped to meet job demands. It also strengthens decision-making processes related to human resource allocation and supports the development of a more structured and competency-based management system.

b. Integrated Competency Data System

The development of an integrated competency data system aims to establish a single, valid, and consistent source of data (single source of truth). This system ensures that competency and certification data are centralized and accessible across the organization. An integrated competency data system enables real-time access to information, ensuring that stakeholders can obtain up-to-date and reliable data when needed. It also promotes consistency of information across organizational units, reducing discrepancies and duplication of data. Furthermore, the availability of centralized and accurate data supports data-driven decision-making in workforce planning and competency management.

The implementation of this system provides significant organizational benefits. It improves the accuracy of workforce allocation by ensuring decisions are based on reliable data, enhances coordination across units, and reduces inefficiencies caused by fragmented information. In addition, it strengthens transparency and accountability in competency management processes, while enabling faster and more effective decision-making. Ultimately, an integrated competency data system supports the development of a more structured,

efficient, and responsive competency management framework, which is essential for improving overall organizational performance.

c. Certification Management Process

Certification management is carried out through a structured process, starting from planning, implementation, monitoring of validity periods, to certification renewal. This process ensures that employee competencies are continuously maintained and remain aligned with evolving organizational and project requirements.

A structured certification management process enables organizations to systematically track certification status, prevent expired certifications, and ensure that personnel meet the required competency standards for their roles. It also supports better planning of certification needs, allowing organizations to anticipate competency requirements and prepare resources accordingly.

The implementation of this process provides significant benefits, including improved compliance with competency standards, reduced risks associated with unqualified personnel, and enhanced workforce readiness. In addition, it strengthens the reliability of competency data and supports more effective workforce planning and project execution.

Ultimately, a well-managed certification process contributes to maintaining the quality of human resources, ensuring that employees possess up-to-date competencies, and enhancing overall organizational performance.

d. Monitoring and Evaluation Mechanism

Monitoring and evaluation are critical mechanisms in ensuring the effectiveness of competency development programs. Monitoring is conducted continuously to ensure that programs are implemented according to plan, while evaluation is carried out to assess the outcomes and impacts of these programs.

Through structured monitoring and evaluation, organizations are able to identify deviations at an early stage and implement corrective actions in a timely manner. This enables continuous improvement in program implementation and ensures that competency development initiatives remain aligned with organizational objectives.

The implementation of a structured monitoring and evaluation mechanism provides significant benefits. It enhances the ability of the organization to measure program effectiveness, improves accountability in the execution of capacity building initiatives, and ensures that investments in competency development deliver measurable results. In addition, it supports data-driven decision-making in refining training programs and optimizing resource allocation.

Ultimately, a well-established monitoring and evaluation mechanism strengthens organizational learning, improves the quality of competency development programs, and contributes to overall performance improvement.

e. Integration with Workforce Planning

The integration of competency data with project workforce planning aims to ensure the availability of personnel that align with project requirements. This integration allows organizations to systematically match competency needs with project demands, ensuring that the right individuals are assigned to the right roles at the right time. By integrating competency management with workforce planning, organizations are able to improve the accuracy of resource allocation and reduce inefficiencies caused by mismatches between competencies

and job requirements. This approach also supports proactive workforce planning, enabling organizations to anticipate future competency needs and prepare resources accordingly.

Furthermore, the integration enhances coordination between functional units and project teams, ensuring that competency data is effectively utilized in decision-making processes. It also strengthens transparency in workforce allocation and supports more structured and consistent planning practices.

The implementation of this integration provides significant benefits, including improved project performance, increased operational efficiency, and better utilization of human resources. In addition, it reduces the risk of delays and rework caused by competency gaps, while supporting the achievement of organizational performance targets.

Ultimately, integrating competency data with workforce planning contributes to the development of a more responsive and efficient organizational system, capable of adapting to dynamic project demands and improving overall organizational performance.

Overall, the findings of this study are consistent with theories of competency management and business process integration, which emphasize the importance of aligning human resources with organizational objectives. Previous studies indicate that integrating competency management with business processes can improve organizational performance by enhancing person–job fit and operational effectiveness (Campion et al., 2020; Cascio & Boudreau, 2016). In addition, the concept of Business Process Management (BPM) highlights that the integration of processes and data is a key factor in improving efficiency and the quality of organizational decision-making (Dumas et al., 2018; vom Brocke & Mendling, 2018).

This study further demonstrates that the integration of competency management into business processes, supported by certification systems and structured monitoring mechanisms, is a critical factor in improving organizational performance. This finding is consistent with the World Economic Forum (2020), which emphasizes the importance of competency development based on job requirements in responding to industry dynamics, as well as PMI (2021), which identifies human resource competency as a key determinant of project success.

CONCLUSION

This study concludes that the current management of engineer competencies at PT XZY is not yet optimal and has not fully supported the increasing organizational demands, particularly in handling a growing number of projects and achieving higher performance targets. The main issue lies in the absence of an integrated competency management system, as reflected in fragmented competency data, misalignment between competencies and job roles, weak monitoring and evaluation mechanisms, and the lack of comprehensive policies governing engineer certification. These conditions lead to inefficiencies in workforce planning and contribute to increasing organizational cultural entropy.

As a solution, this study proposes a structured and integrated business process design for engineer competency management, which includes role-based competency mapping, systematic certification management, integration of competency data as a single source of truth, and strengthened monitoring and evaluation mechanisms. The implementation of this design is expected to improve the effectiveness of workforce planning, ensure alignment between competencies and project requirements, and enhance the quality and timeliness of project execution. Furthermore, a more structured system is likely to reduce cultural entropy by minimizing organizational friction and inefficiencies.

The practical implication of this study highlights the importance of integrating competency management with overall business processes, positioning it not merely as an administrative function but as a strategic element in achieving organizational performance. From a theoretical perspective, this study demonstrates that structured competency management is closely associated with improved organizational effectiveness and reduced cultural entropy.

This study has several limitations, including its focus on a single organization, which limits generalizability, and its reliance on qualitative data that depends on stakeholder perceptions and experiences. Therefore, future research is recommended to develop this model using quantitative or mixed-method approaches and to test its applicability across different organizations to obtain more comprehensive results.

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