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Web Application Development for Key Performance Indicator

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Abstract

This research aimed to design and develop a web application for managing Key Performance Indicators (KPIs), focusing on three key areas: project assignment, project progress reporting, and performance evaluation within organizational settings. The study addresses the problem of inefficient, paper-based performance management systems that lack real-time accessibility, role-based task delegation, and strategic alignment. The proposed system incorporates actual KPIs such as task completion rates, timeliness, and goal alignment indicators based on the Balanced Scorecard (BSC) methodology. The development follows the Design Science Research (DSR) framework, ensuring a systematic approach from problem identification to evaluation. Quantitative methods were employed to assess both technical performance and user satisfaction, using structured questionnaires. Evaluation results from five domain experts showed that system performance was rated at the highest level (mean = 4.53, S.D. = 0.47), while feedback from 18 end-users indicated a high level of satisfaction (mean = 4.17, S.D. = 0.72). The novelty of this system lies in its structured role-based interaction (admin, superior, subordinate), integration of performance monitoring with BSC objectives, and a user-friendly, web-based interface that supports real-time monitoring and evaluation.

Keywords: Web application, Key performance indicator, Work performance

1. Introduction

Within any organization, performance measurement is needed in order to (1) identify the organization's successes, (2) help the organization understand its processes, (3) check whether stakeholder needs are being met, (4) identify where problems lie, and determine where and what improvements are needed, and (5) demonstrate whether the planned improvements actually occurred (Gunasekaran & Kobu, 2007). Key Performance Indicators (KPIs) are major tools used for performance measurement. KPIs can be used to measure the performance of an entire organization or specific processes within it (Blazic et al., 2023). KPIs are a set of performance indicators that capture the most critical performance aspects for an organization's current and future success (Parmenter, 2020). KPIs provide users with information to develop strategies, improve operations, and support decision-making. The indicators can be divided into two groups: (1) quantitative indicators, which are objective facts expressed in numerical values without considering subjective elements such as feelings or biases, and (2) qualitative indicators, which reflect non-numerical characteristics such as personal opinions and perceptions (Jetter et al., 2018).

Performance evaluation is key to improving employee performance (Braglia et al., 2022). In this case, Key Performance Indicators (KPIs) are used to measure the performance levels of all employees within an organization, including operational-level staff, supervisors, managers, and executives. They enable organizations to operationalize their strategic objectives and assess how well they are performing in relation to these objectives (Domínguez et al., 2019). If KPIs are not clearly defined, it becomes difficult to measure employee performance, which may lead to problems in evaluations, future organizational planning, and even salary decisions. Furthermore, managers and executives may not be aware of each individual's limitations and potential, which leads to reduced overall performance (Radovanović et al., 2020, Van de Ven et al., 2023).

In recent years, Pagkon Co., Ltd., a software company, designed and implemented a web application to store all complicated data and documents as digital files. This allows any retired employee to hand over their workload to a new person taking responsibility. The application lessens the complexity, problems, and time required during the handover process, even without additional supporting documentation. Accordingly, with a similar purpose, we developed a web application for Key Performance Indicators (KPIs) to establish work indicators which allow employees to maximize their potential while realizing their limitations to further improve themselves. Furthermore, higher-level employees can monitor and evaluate the performance of their subordinates via the system.

However, many current KPI systems lack real-time communication, role-based access, and integration with organizational strategic planning. Most legacy systems or paper-based approaches cause delays, errors, and inefficiencies. This research addresses this gap by developing a structured web-based KPI system that aligns task delegation and performance reporting with Balanced Scorecard objectives. Recent studies (e.g., Braglia et al., 2022; Van de Ven et al., 2023) suggest the need for more integrated digital KPI tools, underscoring the relevance of this study.

2. Literature Review

This section reviews key studies on web-based KPI systems, organized into three thematic areas: (1) KPI system design, (2) evaluation techniques, and (3) performance measurement frameworks. A comparative summary of selected studies is also included to highlight technological contributions, evaluation methods, and the unique aspects of the current research.

2.1 KPI system design

KPI system design focuses on the structuring, implementation, and management of key performance indicators within digital platforms. Chumpoo (2008) developed a KPI tracking system for the jewelry manufacturing sector, focusing on simplifying paper-based data through digital transformation. Tivawong (2012) designed a performance management system for the Royal Thai Armed Forces, using HTML, PHP, and MySQL, which demonstrated efficiency in task tracking.

Recent work by Verevka (2018) proposed a KPI model for evaluating high-tech enterprises by integrating both financial and non-financial indicators. Morella et al. (2020) introduced a KPI model embedded in a Cyber Physical System (CPS), enabling real-time tracking of economic losses and production inefficiencies. These works illustrate the growing interest in integrated platforms that streamline data collection and support decision-making.

2.2 Evaluation techniques

System evaluation techniques commonly combine expert reviews, usability testing, and user satisfaction surveys. Sriwapee (2011) used a five-step method involving data collection, management, querying, and reporting to evaluate scout activities. Tubmongkhon (2021) applied structured evaluation forms to assess a performance evaluation system for employees in a tour company, which achieved high usability scores. In global contexts, Atikno et al. (2021) categorized KPIs by organizational domains and highlighted their importance in aligning vision, performance, and strategic decision-making. Braglia et al. (2022) proposed an Industry 4.0-based framework for KPI evaluation, emphasizing the need for digital transformation metrics. These studies demonstrate the value of incorporating systematic evaluations to ensure relevance and usability of KPI systems.

2.3 Performance measurement frameworks

The Balanced Scorecard (BSC) and data-driven performance models are commonly used to link strategic objectives with measurable outcomes. Domínguez et al. (2019) introduced a KPI taxonomy for managing performance across different industries. Parmenter (2020) advocated for "winning KPIs" that are actionable and directly linked to key success drivers. Radovanović et al. (2020) introduced digital literacy KPIs as part of sustainable development frameworks, demonstrating the expanding role of KPIs beyond traditional corporate environments. Van de Ven et al. (2023) reviewed KPIs used in digital business models and emphasized the need

for adaptive and technology-integrated performance metrics. These frameworks align with the goal of the current study, which is to connect system design with strategic evaluation.

2.4 Comparative analysis of prior KPI systems

To position the present study within the context of existing research, a comparative analysis of previously developed KPI systems is conducted. Table 1 provides a synthesis of representative studies across various domains, outlining the underlying technologies, targeted KPI dimensions, evaluation methodologies, and principal contributions. This comparative overview highlights the distinctive features and innovations of the proposed system, thereby emphasizing its relevance and contribution within the broader landscape of KPI system development.

Table 1. Comparative analysis of key performance indicator (KPI) systems in prior research.

Study	Technology	KPI Focus	Evaluation Method	Contribution
Chumpoo (2008)	Desktop application (VB, MySQL)	Operational performance in manufacturing	Usability testing	Simplified hard-copy evaluation process
Tivawong (2012)	Web-based (HTML, PHP, MySQL)	Military task performance	Workflow analysis	Improved performance tracking and reporting efficiency
Morella et al. (2020)	Cyber Physical System (CPS)	Real-time loss detection in production	CPS simulations and field tests	Real-time KPI monitoring and economic impact quantification
Tubmongkhon (2021)	Web app	Employee evaluation in tourism	User satisfaction questionnaire	High reliability in digital evaluation tools
Atikno et al. (2021)	Literature analysis & taxonomy	KPI categorization by function and sector	Content analysis	Developed a comprehensive KPI taxonomy
Braglia et al. (2022)	Industry 4.0 framework	Digital transformation KPIs	Structured performance evaluation	Structured approach for digitized KPI metrics
Van de Ven et al. (2023)	Meta-review of digital models	Business model performance indicators	Literature synthesis	Identified adaptive KPIs for dynamic business contexts
Current Study (2025)	Web application (HTML5, PHP8, MySQL)	Task assignment, progress tracking, evaluation	Expert review + user satisfaction survey	Role-based system with real-time BSC-aligned KPI tracking and scoring

3. Research Methodology

This study adopts the Design Science Research (DSR) methodology to guide the development and evaluation of a web-based Key Performance Indicator (KPI) system. DSR is an established framework in information systems research that focuses on creating and evaluating artifacts designed to solve identified organizational problems. The methodology comprises four key phases: (1) Problem Identification, (2) Design & Development, (3) Demonstration, and (4) Evaluation.

3.1 Problem identification

The study began with a comprehensive analysis of performance evaluation challenges within organizations that rely on manual or fragmented systems. Through a literature review, stakeholder interviews, and document analysis, it was found that existing performance management processes lacked integration, real-time data access, and structured workflows. These gaps hinder the effective monitoring of employee progress and the alignment with strategic goals. The problem identified was the absence of a centralized, role-based digital platform capable of tracking project assignments, progress, and KPI-based evaluations.

3.2 Design and development

Based on the problem analysis, a web-based KPI application was designed and implemented. The system architecture includes three primary user roles—Administrator, Superior, and Subordinate—each with distinct responsibilities in the performance evaluation process. The system was developed using HTML5, JavaScript, and PHP8, with a MySQL database managed via phpMyAdmin. The user interface was designed using principles of simplicity and clarity to support ease of use across user roles.

To support transparency and usability, the core system functions for each user role are outlined as follows:

1) Superiors can assign tasks or projects to their subordinates.

2) Subordinates can report their achievements or the progress of the assigned project back to their superiors

3) Superiors can grade their subordinates according to the reported achievements.

Figure 1 shows the system structure from the system analysis above. The process begins when (1) an administrator creates a work plan, including, Balanced Scorecards (BSCs), objectives (OBJs), statistics (Stc), and key performance indicators (KPIs). Then, (2) the plan is forwarded to superiors in order to create the details of the projects. (3) For the sake of plan completion, the newly created plan needs to be approved by the administrator. Then, again, (4) the plan is forwarded to subordinates. The process of (2) and (4) may be repeated as long as there is someone with a lower position. (5) As soon as the plan is forwarded to the lowest-ranking personnel, they can edit the details of the projects to explain their achievements. (6) When the project is completed or the project progress report is required, the subordinates can report their achievement or project progress back to their superiors. Finally, (7) each superior can grade their subordinates' achievement (KPI value).

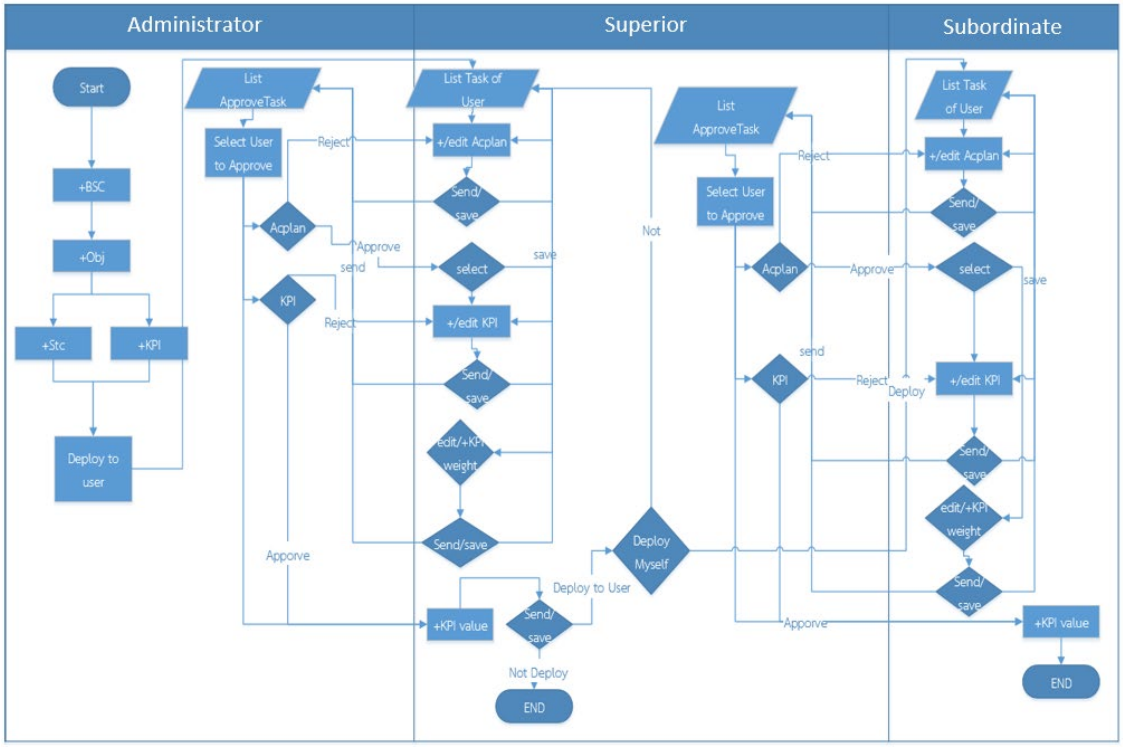


Figure 1. The system structure of the web application for key performance indicator.

We design the web application based on a graphical user interface (GUI) in order to simplify the documentation process according to the data analysis. Figure 2 shows the design based on a context diagram. There are three types of system users, including administrators, superiors, and subordinates (no change needed, but the comma after "including" should be removed). The role of administrators is to create an action plan, add KPI values, and review the details of action plans created by superiors. Superiors receive a plan from the administrator and fill in all details. Then, they request approval from the administrator and forward the plan to subordinates. Finally, subordinates fill in the details of their own action plan and achievement and then report back to their superiors.

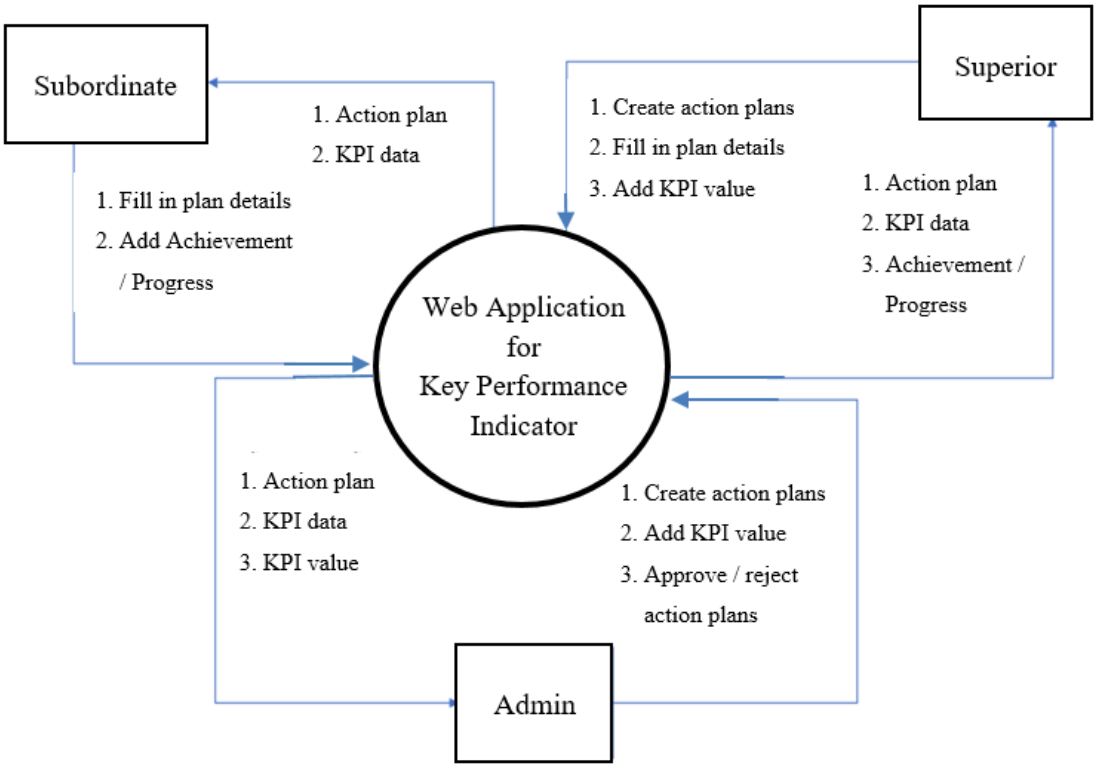


Figure 2. The design of the web application for key performance indicator

3.3 Demonstration

Following the completion of system development, the web-based KPI application was deployed in a real-world environment at Pagkon Co., Ltd., a medium-sized enterprise engaged in technology-driven operations. The demonstration phase aimed to assess the feasibility and functionality of the system under operational conditions and involved actual end-users representing various organizational roles—namely, administrators, superiors, and subordinates.

The demonstration also allowed users to interact with system features such as dashboard visualizations, real-time notifications, and KPI evaluation interfaces. Data entered by all user groups were automatically stored and processed within the MySQL database, providing a unified view of performance metrics and enabling timely feedback loops between hierarchical levels.

3.4 Evaluation

The evaluation phase included both expert review and user satisfaction assessment. Five experts in software engineering and performance evaluation were invited to assess system functionality using a structured performance evaluation form. In parallel, 18 target users participated in a user satisfaction survey after using the system for one month.

In this research, we compared the evaluation results to the scale from Areerath (2014), which is indicated below:

The mean value between 4.50 - 5.00 is referred to as "highest"
The mean value between 3.50 - 4.49 is referred to as "high"
The mean value between 2.50 - 3.49 is referred to as "moderate"
The mean value between 1.50 - 2.49 is referred to as "low"
The mean value between 1.00 - 1.49 is referred to as "lowest"

3.4.1 Questionnaire validation

The user satisfaction questionnaire was reviewed by subject-matter experts to ensure content validity.

The reliability was tested using Cronbach's alpha, resulting in a score of 0.85, indicating high internal consistency.

3.4.2 Technical performance metrics

In addition to subjective evaluation, the system's technical performance was monitored and quantified. The following metrics were recorded: average system response time: 1.2 seconds, error rate: 2.1%, and system uptime: 99.7%.

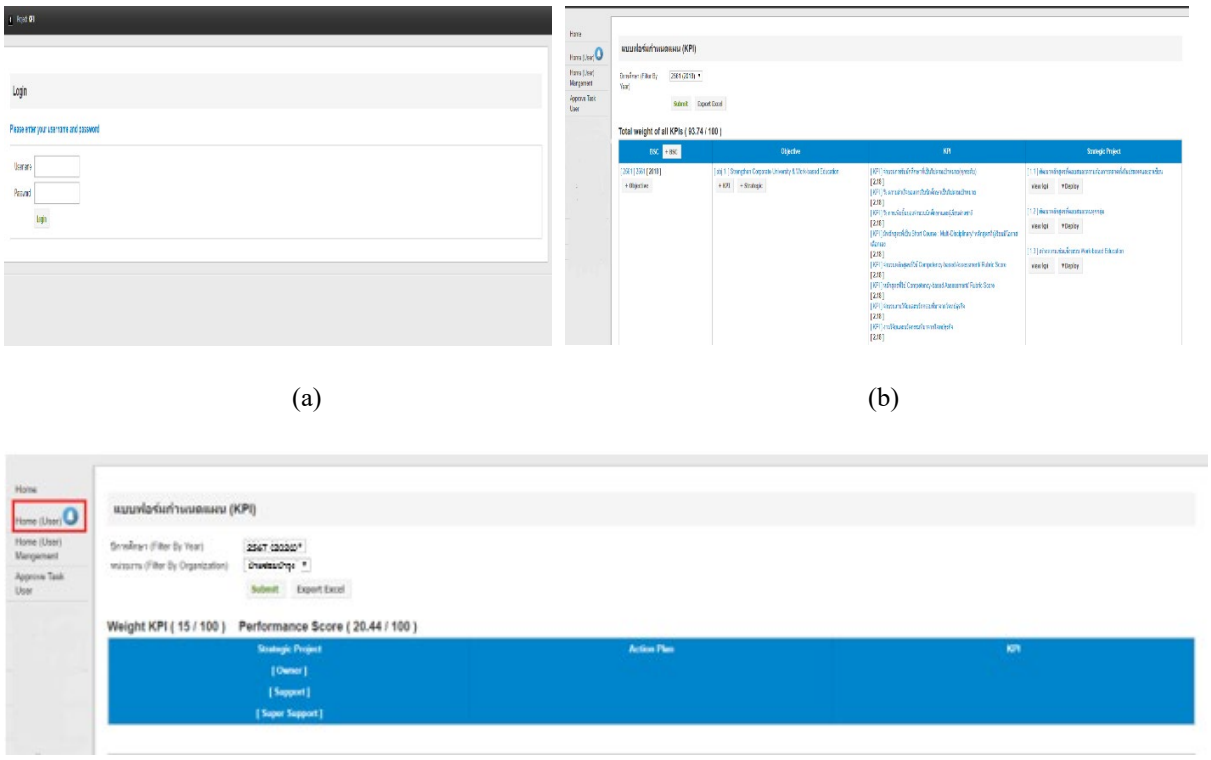
3.4.3 Sample size consideration

Although the results indicated high system usability and user satisfaction, the relatively small sample size—five experts and 18 users—may limit the generalizability of the findings. Future studies are planned to include a larger and more diverse group of users.

4. Results and Discussion

4.1 Results of the web application development

We have proposed a web application for key performance indicators according to the methodology. As a result, Figure 3 shows the web application for key performance indicators. Figure 3(a) shows the authentication page which can be logged into by any user, including administrators, superiors, and subordinates. Figure 3(b) shows the page used to create an action plan. Figure 3(c) shows the page where users can create KPIs.



(a) (b)

(c)

Figure 3. The web application for key performance indicator.

4.2 System performance evaluation

The system performance evaluation was performed by five experts in related fields. Then, the result was analyzed as shown in Table 2.

Table 2. The performance evaluation result of the web application for key performance indicator.

Evaluation	$\bar{x}$	S.D.	Level
1. Usability	4.60	0.49	highest
2. Design	4.40	0.49	high
3. Simplicity	4.60	0.49	highest
4. Research objectives	4.80	0.40	highest
5. Computational speed	4.40	0.49	high
6. Overall performance	4.40	0.49	high
Total	**4.53**	**0.47**	**highest**

From Table 2, the overall evaluation result is at the highest level ($\bar{x}$ = 4.53, S.D. = 0.47). Usability, simplicity, and research objectives are at the highest level, while the other three, including, design, computational speed, and overall performance are at a high level.

4.3 User satisfaction

We ran a performance test for a month, then, gathered the user satisfaction with the system using a questionnaire. The result is shown in Table 3.

Table 3. The user satisfaction towards the web application for key performance indicator.

Evaluation	$\bar{x}$	S.D.	Level
1. Usability	4.06	0.78	high
2. Design	4.22	0.71	high
3. Simplicity	4.39	0.76	high
4. Overall performance	4.11	0.66	high
5. Reliability	4.06	0.70	high
Total	**4.17**	**0.72**	**high**

From Table 3, the user satisfaction with the web application for key performance indicators is at a high level ($\bar{x}$ = 4.17, S.D. = 0.72). The results across all aspects are rated at the same high level.

The high scores in usability and simplicity reflect the intuitive design and minimal required training needed for users. Lower scores in design may be related to basic UI aesthetics, suggesting the need for future UX refinement. The results align with research objectives, confirming the system's practical functionality. However, system limitations include the lack of mobile responsiveness and limited scalability for larger organizations.

5. Conclusion

We have proposed a web application for key performance indicators in order to simplify the documentation of work evaluation process. The system is designed and implemented according to the research objectives and research methodology. There are three types of users in the system, including, administrators, superiors, and subordinates. Each user type has different roles in the evaluation process. Administrators are responsible for creating the action plan and approving the action plan. The superiors responsible for adding further detail in the action plan. Finally, subordinates are responsible for creating their own working plan and reporting the achievement and progress of their project.

The result of the system performance evaluation is divided into two parts. 1) The system performance is rated at the highest level ($\bar{x}$ = 4.53, S.D. = 0.47) by five experts in related fields. 2) The users of the system reported high satisfaction towards the system ($\bar{x}$ = 4.17, S.D. = 0.72).

The main contribution of this research is the development of a role-based, modular KPI system aligned with strategic planning. In the future, the system will be enhanced with mobile support, AI-driven analytics, and deployment across larger institutional environments to test scalability.

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Conflict of Interest

No conflict of interest.

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References

Areerath, W. (2014). *Innovation of electronic media grouping for education* [Doctoral dissertation, Faculty of Science and Technology]. Phranakhon Rajabhat University, Thailand.

Atikno, W., Setiawan, I., & Taufik, D. A. (2021). Key performance indicators implementation: Literature review and development for performance measurement. *Indonesian Journal of Industrial Engineering & Management*, *2*(3), 189–197.

Blazic, M., Ivetic, D., Popov, S., Berkovic, I., & Ognjenovic, V. (2023). An overview of KPI and metrics in Cloud services. *Engineering Conference*. Becici, Crna Gora.

Braglia, M., Gabbrielli, R., Marrazzini, L., & Padellini, L. (2022). Key performance indicators and Industry 4.0 – A structured approach for monitoring the implementation of digital technologies. *Procedia Computer Science*, *200*, 1626–1635. https://doi.org/10.1016/j.procs.2022.01.363

Chumpoo, A. (2008). The development of computer programming for calculating key performance indicator (KPI) in jewelry gauge and tester industry. *The Journal of King Mongkut's University of Technology North Bangkok*, *18*(1), 57–67.

Domínguez, E., Pérez, B., Rubio, A. L., & Zapata, M. A. (2019). A taxonomy for key performance indicators management. *Computer Standards & Interfaces*, *64*, 24–40. https://doi.org/10.1016/j.csi.2018.12.001

Gunasekaran, A., & Kobu, B. (2007). Performance measures and metrics in logistics and supply chain management: A review of recent literature (1995–2004) for research and applications. *International Journal of Production Research*, *45*(12), 2819–2840. https://doi.org/10.1080/00207540600806513

Jetter, J., Eimecke, J., & Rese, A. (2018). Augmented reality tools for industrial applications: What are potential key performance indicators and who benefits?. *Computers in Human Behavior*, *87*, 18–33. https://doi.org/10.1016/j.chb.2018.04.054

Morella, P., Lambán, M. P., Royo, J., Sánchez, J. C., & Latapia, J. (2020). Development of a new KPI for the economic quantification of six big losses and its implementation in a Cyber Physical System. *Applied Sciences*, *10*, 9154. https://doi.org/10.3390/app10249154

Parmenter, D. (2020). *Key performance indicators: Developing, implementing, and using winning KPIs*. Wiley.

Radovanović, D., Holst, C., Belur, S. B., Srivastava, R., Houngbonon, G. V., Quentrec, E. L., Miliza, J., Winkler, A. S., & Noll, J. (2020). Digital literacy key performance indicators for sustainable development. *Social Inclusion*, *8*(2), 151–167.

Sriwapee, K. (2011). *Development of information system for evaluation of boyscout activities for students at Mahasarakham Technical College* [Master' thesis, Department of Computer and Information Technology]. King Mongkut's University of Technology Thonburi.

Tivawong, N. (2012). *A web-based information system for performance evaluation case study: Royal Thai Armed Forces Headquarter* [Master's thesis, Faculty of Engineering]. Dhurakij Pundit University.

Tubmongkhon, S. (2021). Information system development for measuring performance with key indicators for Nakhonchai Tour Company Limited. *APHEIT Journals*, *10*(2), 1–9.

Van de Ven, M., Machado, P. L., Athanasopoulou, A., Aysolmaz, B., & Turetken, O. (2023). Key performance indicators for business models: A systematic review and catalog. *Information Systems and e-Business Management*, *21*, 753–794.

Verevka, T. (2018). Key performance indicators of high-tech enterprises. *SHS Web of Conferences*, *44*, 00077.