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Key Performance Indicators Implementation: Literature Review and Development for Performance Measurement

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A B S T R A C T

Recently a Key Performance Indicators (KPIs) performance measurement tool is developing very rapidly. KPIs have a very important meaning for a company. This paper aims to identify KPIs and classify them based on different perspectives such as publication by region, publication of industrial sector, publications by years, benefits implementing and development for perfomance measurement. This research is based on a literature review of article based on KPIs in the European region between 2015-2020. The implementation of these KPIs can be implemented in many organizations, such as manufacturing, service, health and research. KPIs can provide changes to an organization that implements them. KPIs themselves can be distinguished in many ways. There are KPIs for information technology, finance, maintenance management, production processes, design dan PPIC. This paper provides benefits for further research to increase literature and understanding regarding the implementation of KPIs.

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1. INTRODUCTION

Recently, a Key Performance Indicators (KPIs) performance measurement tool is developing very rapidly. KPIs have a very important meaning for a company. KPIs are management tools or instruments so that an activity or process can be followed, controlled and ensured to achieve the desired performance. One way to achieve good indicators in employee performance appraisal is by using the KPIs method (Setiawan & Purba, 2020). Without KPIs, companies must suppose about measuring the performance of their employees. In fact, without employees who can work well, the company will not run well. Without a large profit, the company can go bankrupt overtime or stay quiet as a small-scale business.

The importance of KPIs for a company means that their existence cannot be taken lightly. That is, the development of indicators used must be truly valid and reliable. Without these conditions, the results of the assessment using the KPIs are useless. On the other hand, the assessment results may be misleading and make a company resign because the

information obtained is incorrect (Attia et al., 2020). KPIs themselves can be distinguished in many ways. There are KPIs for information technology, finance and accounting, maintenance management, production processes, design to PPIC. Some indicators in measurement cannot be applied just like that. Companies must know which one is the standard to find out the answers related to meeting the standard qualifications. Moreover, the essence of KPIs is an assessment built with objectivity, not subjectivity, so that the implementation cannot be done carelessly. Research by Asih et al., (2020) showed that KPIs can be implemented in many of industrial sector or other, as shown to improve the satisfaction, better service, and others.

Knowledge of the expected standards must also be in accordance with the company's vision and mission. Therefore, the development of KPIs must be based on good knowledge for the company. Without this basis, the developed KPIs will not provide good feedback for the company. The implementation of KPIs must be maximal. An honest answer is needed so that the assessment can be used to improve for a better company. The implementation of KPIs in the automotive industry can provide an overview of the productivity quality of each criterion (Paduloh and Purba, 2020). Without honesty in the assessment, the process is useless, one of which aims to improve the company.

With a good assessment and good overall implementation, the company can develop better. Employees can produce a better quality performance if the assessment results are used to improve the quality provided. Thus, the company does not need to lose employees, which can hurt the company continuously. In general, the KPIs main goals/goals are as follows (Meyer, 2006): 1) As a benchmark (measure, monitor a company's performance) periodically. 2) Management tools to control and evaluate all team members in achieving daily/weekly/monthly/annual goals. In its implementation, KPIs requires a very measurable and systematic stage, namely SMART (Specific, Measurable, Achievable, Relevant, Timely). This paper aims to identify KPIs and classify them based on different perspectives such as publication by region, publication of industrial sector, publications by years, benefits implementing and development for performance measurement.

2. RESEARCH METHODS

Literature This paper aims to explore more deeply the implementation of Key Performance Indicators in various companies. This paper aims to describe the knowledge of Key Performance Indicators, considering Key Performance Indicators as an appropriate strategy in measuring an organization, system, process and product standardization.

The methodology used is a systematic literature review to identify, explore and classify several research results on Key Performance Indicators. This study paper begins with the submission of various papers between 2015 and 2020. The keyword in the search for the paper used is "**Key Performance Indicators**". In making this paper specific, clear and directed, it is necessary to carry out the following stages:

The first stage is to determine the study's topic, namely implementing key performance indicators in Europe. The second stage is to collect papers according to relevant topics in various well-known databases such as **Google Scholar**, **ScienceDirect** and **Research Gate**. The third step is to filter and map several articles and get articles according to highly relevant theme topics. Then summarize all relevant articles based on paper identity, industrial sector and results. In the fourth stage, all articles are grouped such as publication by sector industry, publication by year and publication by region. The final step is to find research gaps and opportunities for implementing Key Performance Indicators for future research. For more details on the literature review steps in this paper, can be seen Fig. 1.

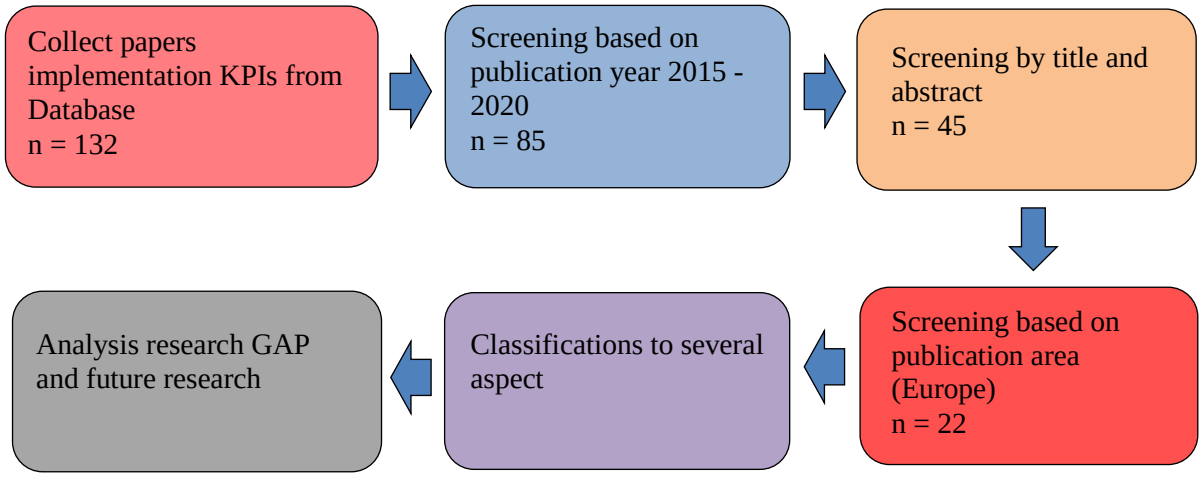

Fig. 1. Study of literature framework

3. RESULT AND DISCUSSION

This paper describe 22 articles related to the implementation of Key Performace Indicators in the European region and are classified based on paper identity, industrial sector and results. This summary can be seen in Table 1

Table 1. An existing literature review of key performance indicators

No	Paper Identity	Sector	Findings
1	Sabia et al. (2020)	Waste treatment	The margins for energy savings higher than 60%.
2	Feiz et al. (2020)	Waste treatment	KPI plays a role in making decisions related to the development of biogas solutions from food waste in the future.
3	Attia et al. (2020)	Student housing	Forty-four key performance indicators were identified; the tool provides a novel approach to assess student housing.
4	Walker et al. (2020)	Waste treatment	Proportion of water passing through the largest four treatment works exhibited a significant negative effect on economic efficiency.
5	Bhadani et al. (2020)	Manufacturing	KPIs implemented in the dynamic simulation platform can be used to explore and optimize a crushing plant's design and operations
6	González-Camejo et al. (2020)	Waste treatment	These parameters were inversely related to nitrogen recovery rates and biomass productivity and could help prevent possible culture deterioration.
7	Wohlers et al. (2020)	Manufacturing	KPIs concept to a manufacturing process in the mechatronic system domain and an operation process in the food production domain
8	Siedler et al. (2020)	Manufacturing	Improvement KPIs digital technologies by inserted a simulation model
9	Brint et al. (2020)	Manufacturing	Several large industrial organizations have launched Big Data programs to address the complexity of supply chains and the requirements for measuring performance
10	Assad et al. (2019)	Manufacturing	e-KPI can support manufacturing system designers in making decisions in component selection and process design

No	Paper Identity	Sector	Findings
11	McCabe et al. (2019)	Hospital	A total of 9,276 ED patient records were used for data abstraction to validate the Cohen kappa median between 0.56 to 0.81 internally.
12	Scheepmaker et al. (2020)	Transportation	Energy consumption coincided with the optimal energy-efficient train control strategy, or it has an energy efficiency close to the optimal
13	Andersson & Thollander (2019)	Manufacturing	The study outlines a preliminary model for evaluating the best practice levels of energy KPIs
14	Cherni et al. (2019)	Business process	The result can identify KPIs deviations based on quality, cost, time and flexibility, and resolve them by automatically applying redesign patterns
15	Varisco et al. (2018)	Manufacturing	The KPIs specified in the ISO 22400 standard are suitable for direct application in performance measurement systems.
16	Wiktorsson et al. (2018)	Manufacturing	A concept for considering operational and design KPIs in early development phases of the manufacturing system lifecycle
17	Zhang et al. (2017)	Manufacturing	The proposed method can detect errors better than the previous method
18	Elhuni & Ahmad (2017)	Oil and gas	There are 3 out of 14 factor indicators proposed as KPIs for evaluating sustainable production
19	Dumitrache et al. (2016)	Transportation	Increasing average daily trips and increasing transport capacity
20	Schmidt et al. (2016)	Manufacturing	Availability of renewable energy to save costs and reduce emissions
21	Popa (2015)	Research	KPIs are used as support for managerial decisions and learning and development
22	Chioua et al. (2015)	Manufacturing	The proposed method can be extended to non-oscillating data by weighing each frequency bin with spectral PCA for KPIs

Paper Clusterization

Based on clustering, article collected from publications from 2015-2020 (Fig. 2) and the most dominant articles implemented in the manufacturing industry (Fig. 3). KPIs are new indicators/benchmarks of success in measuring performance. KPIs' success in various industrial sectors in the European region to assess the company's operational implementation based on its vision and mission so that organizational improvements can be seen and improve the quality of decision making.

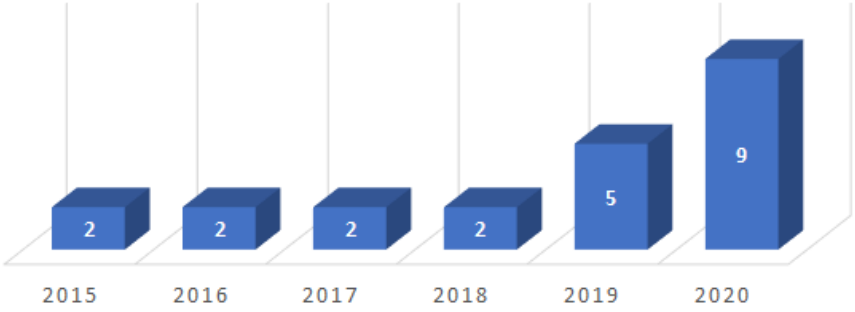

Fig. 2. Publication by year

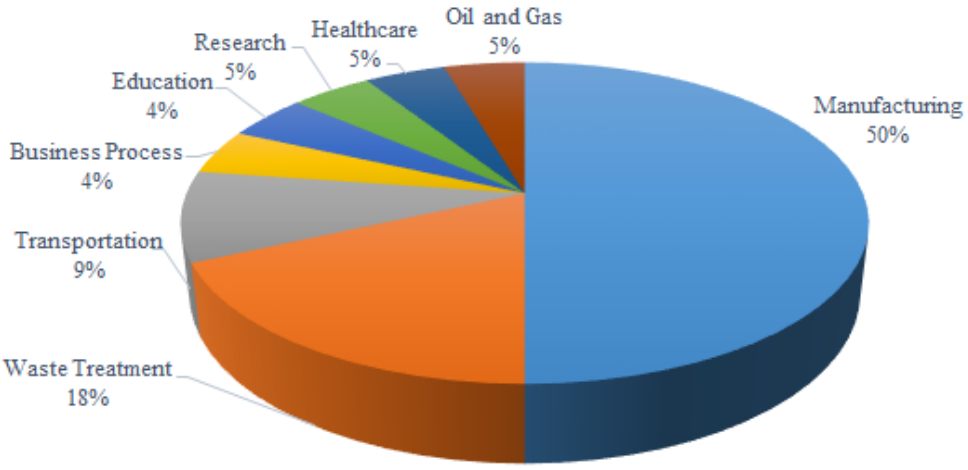

Fig. 3. Publication by sector industry

KPIs provide several benefits to the company. When applied in waste treatment, KPIs play a role in making decisions regarding the development of biogas solutions from food waste in the future (Feiz et al., 2020). In Manufacturing, e-KPI can support manufacturing system designers in making decisions in component selection and process design (Assad et al., 2019). In transportation services, KPIs can increase average daily trips and increase transportation capacity (Dumitrache et al., 2016). In the oil and gas industry, producing 3 out of 14-factor indicators are proposed as KPIs to evaluate sustainable production (Elhuni & Ahmad, 2017). In the business process (Cherni et al., 2019), the results can identify KPI deviations based on quality, cost, time and flexibility, and overcome them by automatically implementing a redesigned pattern. Meanwhile, research by (Popa, 2015) produces KPIs to support managerial decisions and learning and development.

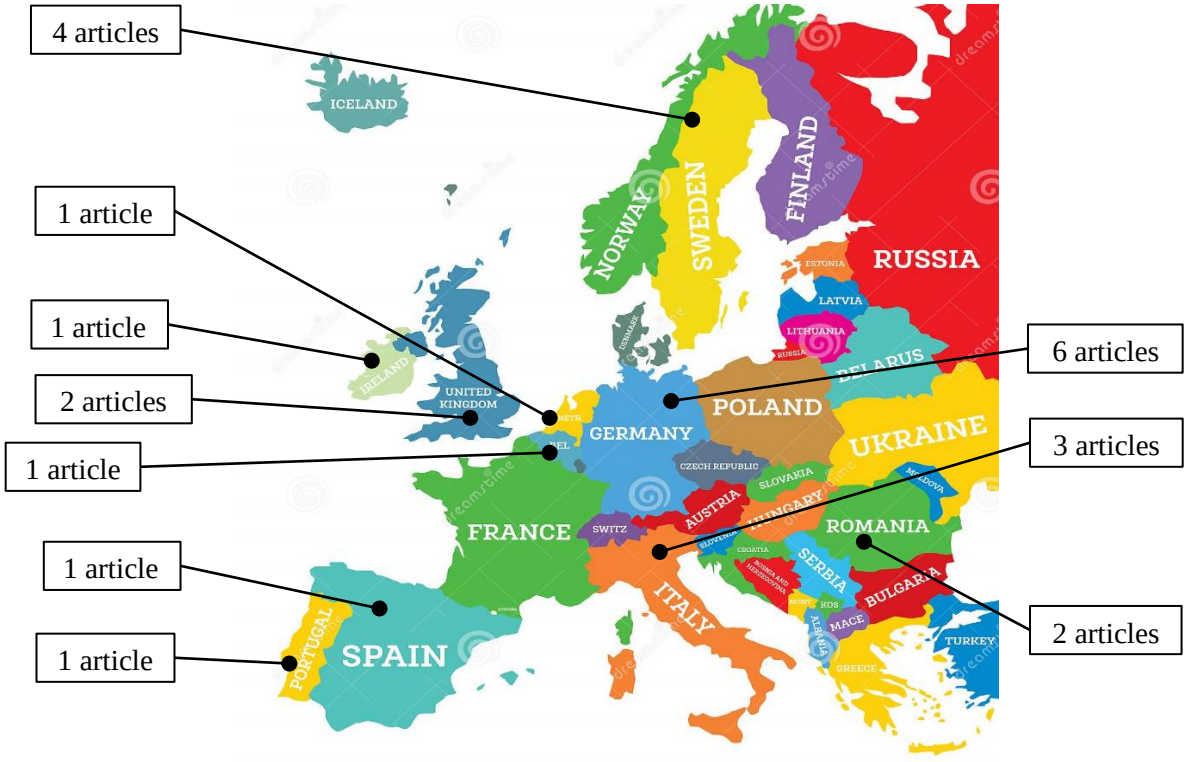

Fig. 4. Publication by region

This paper classifies KPI implementation publications in various industrial sectors based on countries in the European region (Figure 4). This paper identify, Germany is the supplier of the most significant number of publications with six articles followed by Sweden with four articles, Italy with three articles, Romania and the United Kingdom with two articles each and Portugal, Netherlands, Ireland, Spain, Belgium each one article.

KPIs implementation success factors

There are several important factors for KPIs to be implemented successfully. The explanation of a successful KPIs implementation is if all performance can be evaluated thoroughly according to the parameters of the company's vision and strategy. The performance results must be followed up on an ongoing basis to improve employee capabilities. The first factor for the successful implementation of KPIs is the application of a reward and punishment system to employees based on the acquisition of KPIs. Employees are motivated to work smarter because they feel valued by the company. Another factor that is no less important is the presence of top management among its employees. This attendance factor is very important so that leaders can recognize the needs and challenges experienced by their employees.

Based on the success factors for implementing KPIs, it is necessary to have control from the company. Controlling KPIs in accordance with the five basic SMART principles (specific, measurable, achievable, relevant, time) will be able to bring the company to the level of success. Performance indicators must be prepared specifically and in detail. KPIs have properties that must be measured objectively and on target. This will make it easier to monitor its implementation

KPIs have a big impact on the company if they are implemented with a good structure and systematic. The following are some of the positive impacts that companies get when implementing KPIs. 1) It is easier for companies to measure or evaluate employee performance, and can reduce the element of subjectivity because employee performance appraisals are measured more objectively. 2) Employees have the motivation to work more optimally to achieve company targets. 3) The more measurable performance results can be used as a reference to reward employees with better performance. In addition, employees can be punished if their performance is not good. 4) KPI can provide a reference for a company to achieve its goals because there are good guidelines for every employee and company.

Implementation of KPIs in HSE for future research

Currently, European companies are aggressively reducing the rate of occupational accidents and occupational diseases. For this reason, this paper briefly reviews the role of KPIs as the main indicator in reducing the number of occupational accidents and diseases. KPIs in Safety health and environment consists of three core parts: the safety element, the health element, and the environmental element. The three are related to each other and have a role that must be considered in its success. This aspect is in the form of knowledge and application of accidents and diseases that occur as a result of an employee's work at a company and the company's impact on the surrounding environment.

Examples of KPIs for safety, health and environment, especially in health and safety, usually include the following: 1) The number of fatal events for every 100,000 hours worked. 2) Number of health checks in one month. 3) An increasing number of problems in the areas of safety, health and environment. 4) Number of training hours spent on safety and health training each month. Meanwhile, the example of KPIs for safety health and environment, especially for the environment sector, usually includes the following: 1) The amount of energy stored because of the energy conservation and efficiency efforts that are carried out 2) The average amount of electricity consumption for each employee used for work and its products. 3) The amount of water used by employees for each month. 4) The amount of green house gas (GHG) emitted by employees every month. 5) Number of paper pages used by employees for each month.

The relationship between KPIs and Industry 4.0

In this era, it has entered the modern era. An era where all work is based on technology. In today's industry 4.0 has an important role. All work activities will be easy and assisted by the presence of industry 4.0. Developing industries 4.0 such as IoT, cloud computing, realtime, AI and others. In a company, in measuring performance with KPIs, it can be linked to industry 4.0 (Fig. 5). If the company originally used sheet manualization in performance testing, now in line with Industry 4.0, it has changed to using a monitoring dashboard. So that the implementation becomes easy, so it makes it easier to evaluate and decisions making.

Various main indicators are collected into one. This unit is transformed into big data accumulated in realtime into reports, weekly, monthly, and annually. With this, companies in Europe have the opportunity to implement KPIs based on Industry 4.0.

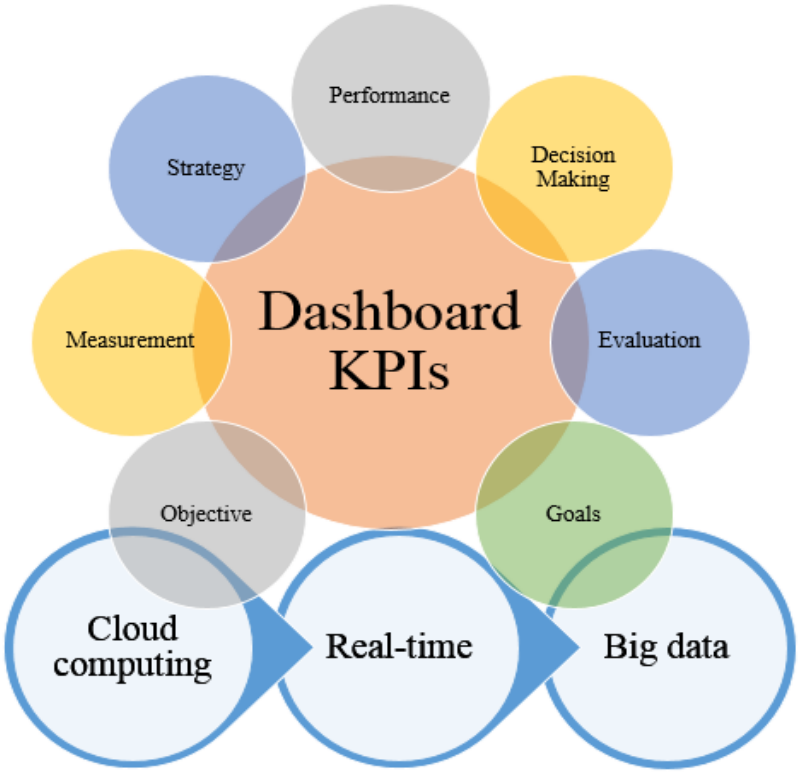

Fig. 5. Development KPIs for future

4. CONCLUSION

There are three main focuses of KPIs as a management system: focus on performance measurement, vision and mission and decision making. The literature review in this paper shows that the study of KPIs in European countries focuses on improving organizational performance, assisting in decision making, assisting in component selection, evaluating sustainable production and learning and growth. Future research can apply KPIs in other contexts apart from measuring the performance of human resources, production processes, finance, information technology such as performance measurement in Health Safety & Environment.

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