A Model for Analysis of Key Performance Indicators in Manufacturing Industries

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Abstract- The main purpose of this research is to identify the most accurate and timely decision of operations. The primary objective is to study and analyze the various categories of operations and its management and control. The scope of the study is to understand the operations of the company and support in delivering consistent quality to clients and also ensure to utilize the resources efficiently.

The research is carried out using the secondary data to bring about the opinion about the operations management of the organization. Data collection is done through analyzing the records, reports and journals of the company.

The research design used here is analytical in nature. The information is collected from the company manuals and office records pertaining to purchase and operations department of the company. Variance analysis, Correlation analysis, Regression analysis and Trend analysis and are the tools used for processing the data obtained to meet the objectives of the study.

I. INTRODUCTION

A Key Performance Indicators is used to find how company is achieving their objectives regarding their business. Company uses KPIs to evaluate their success to reach certain targets.

In KPIs there are High – level and Low- level, High - level is used to focus on overall performance and Low – level is used to focus on Centre like Quality, Finance, SDE, SDE Purchase, Purchase Program, Production, Team, Safety, HR and Logistics.

An operational KPI is a quantifiable value expressing the business performance in a shorter time-frame level. They are used in different industries to track organizational processes, improve efficiency and help businesses to understand and reflect on the outcomes. The KPIs are measured by using business analytics software and reporting tools. A Good KPI has the following characteristics like it provides clear information towards the target, use to make valuable decisions, used to measure the quality, efficiency, and performance.

The limitations of using Key Performance Indicators are, it requires continuous monitoring and employees can be pushed too hard aiming specially for KPIs.

II. OBJECTIVES OF THE STUDY

- PRIMARY OBJECTIVE:

To construct a model for analysis of Key Performance Indicators.

- SECONDARY OBJECTIVES:

To analyze the Key Performance Indicators based on

i. Quality.
ii. Finance.
iii. SDE.
iv. SDE Purchase.
v. Purchase.
vi. Program.
vii. Production.
viii. Team.
ix. Safety.
x. HR
xi. Logistics

To classify the KPI used in the manufacturing company.

To suggest a model for KPI analysis Centre-wise and Year-Wise.

III. RESEARCH METHODOLOGY

The research design used here is Analytical Research. It uses facts or information already available, and analyze them to make a critical evaluation of the material. It involves the in-depth study and evaluation of available information in an attempt to explain complex phenomenon.

IV. LIMITATIONS OF THE STUDY

- An enterprise data in its purest form might have errors.
- Missing information that may skew the key performance indicators (KPI) results.

V. REVIEW OF LITERATURE

1. Review of Key Performance Indicators for Process Monitoring in the Mining Industry

(Gackowiec et al.2020) Podobinska conducted a study on Key Performance Indicators for Process Monitoring in the Mining Industry. Using the conducted research and analysis, a list of indicators has been developed concerning person groups, which may serve as a benchmark for mining industry entities. The analysis of industry reports showed that mining companies assign considerable importance to the aspect of sustainable development, taking into account both operational issues and environmental aspects in their activities, with the intent to improve the overall sustainability of the system.

2. Identification of multidimensional key performance indicators for manufacturing companies

(Marek et al.2020) Schuh conducted study on Identification of multidimensional key performance indicators for manufacturing companies. The identified KPIs form the basis for a holistic analysis of the operational performance of the company also, it is possible to create comparability between companies and thus provide the basis for cross-company optimization. By identifying factors influencing the KPIs, levers for increasing performance can be identified and thus improvement measures can be derived. With regard to the increasing relevance of networks, it would be interesting to identify whether an improvement in cross-company cooperation could also improve internal KPIs.

3. Key performance indicators in the production of the future

(Joppen.R et al.2019) Von Enzberg.S conducted a study on key performance indicators in the production of the future. This study analysed typical KPIs and represents their mathematical interconnection in a graph representation. In addition, a structuring framework is presented, in which KPIs are linked to Industry 4.0-related changes in Production. In this paper they presented a concept of Key Performance Indicators in the production of the future. Based on literature research and project work we analysed typical KPIs and represented their mathematical interconnection in a graph representation. In addition, a structuring framework is presented, in which KPIs are linked to Industry 4.0-related changes in production. We concluded how current typical KPIs capture these changes and demonstrate the benefit of additional, IT related KPIs.

4. Evaluation of Key Performance Indicators of Logistics Firms

(Gozacan et al.2020) Lafci conducted a study on evaluation of Key Performance Indicators of Logistics Firms. The results states that the most important KPI, which is compatible with SMART criteria are fill rates, backorder/stock-outs, shipping error, lead time, and on-time delivery. Accordingly, the preferences of the logistics companies, depending on the preferences of quality perception, and KPIs change and develop depending on the understanding of quality. This research provides the basis for the next study. The next research should concentrate on the evolving concept of performance along with the requirements of the ever-evolving idea of Logistics 4.0 and how the present circumstances will evolve.

5. Competences in the Quality Management System Evaluation Based on the Most Worldwide Used Key Performance Indicators

(Zavadsky et al.2019) Korenkova conducted a study on Competences in the Quality Management System Evaluation Based on the Most Worldwide Used Key Performance Indicators. The goal of this study is to identify the most worldwide used group of indicators in manufacturing area, to identify responsibility and

authority of the measuring and evaluating quality management system, and to create an illustrative competency-based model of quality management system within a business. This paper presents findings from qualitative research to eliminate the risks of the Z-MESOT matrix that was transposed into the questionnaire. The questionnaire, as well as structured interviews, helped identify differences in responsibility attributes of the Z-MESOT matrix in regards to the size of the businesses researched.

6. Key performance indicators for biogas production—methodological insights on the life-cycle analysis of biogas production from source-separated food waste

(Feiz et al.2020) Johansson conducted a study on key performance indicators for biogas production—methodological insights on the life-cycle analysis of biogas production from source-separated food waste. The KPIs provide useful input into decision-making processes regarding the future development of biogas solutions from food waste. By considering the multiple functions of biogas production from food waste, they propose a few key performance indicators (KPI) to allow comparison of different biogas production systems from the perspectives of climate impact, primary energy use, nutrients recycling, and cost. They demonstrated the operational use of our method through an example, where alternatives regarding the heat supply of the biogas plant are investigated. They demonstrated how global and local sensitivity analyses can be combined with the suggested taxonomy and KPIs for uncertainty management and additional analyses. The KPIs provide useful input into decision-making processes regarding the future development of biogas solutions from food waste.

7. Monitoring and control of production processes based on key performance indicators for mechatronic systems

(Wohlers et al.2020) Dziwok conducted a study on Monitoring and control of production processes based on key performance indicators for mechatronic systems. In this study they have applied their KPI concept to a manufacturing process in the mechatronic system domain and an operation process in the food production domain. In this paper, they further refine KPI concepts und evaluate them for two different use cases: They apply KPI concept to a manufacturing process in the mechatronic system domain and an operation process in the food production domain. They provided detailed insights in how we applied our concepts within these domains and report about lessons learned. In addition, they provided a business case estimation for software solution that assesses the KPIs of food production domain example.

8. Comparative analysis of thermal energy storage technologies through the definition of suitable key performance indicators

(Palomba et al.2019) Frazzica conducted a study on Comparative analysis of thermal energy storage technologies through the definition of suitable key performance indicators. Aim of the study is the definition of a set of KPIs that can be used for the comparative analysis of different TES. A review of methodologies used for the definition of KPIs in different sectors was realised and a novel methodology, based on the comparative assessment of literature analysis and evaluation of technology roadmaps was proposed. According to this methodology, the technical, socio-economic and environmental constraints defined by researchers and policy makers were identified and translated into KPIs.

9. Performance indicators for measuring the effects of Smart Maintenance

(Lundgren et al.2020) Bokrantz conducted a study on Performance indicators for measuring the effects of Smart Maintenance. This study aims to support industry practitioners in selecting performance indicators (PIs) to measure the effects of Smart Maintenance, and thus facilitate its implementation. With the purpose of ensuring productive, robust and sustainable production systems through the implementation of Smart Maintenance, this study has analysed and categorised 170 maintenance PIs to support the selection of PIs targeting the anticipated effects of Smart Maintenance. This paper serves as a guide for industry practitioners to select relevant PIs for each of the anticipated effects of Smart Maintenance.

10. Analysis and development of a key performance indicators model for the paper industry

(Tieber et al.2021) Manolache conducted study on analysis and development of a key performance indicators model for the paper industry. Based on the elements revealed by this analysis, a KPIs - Model for processes, production, financials, quality, supply chain, human resources and innovation is developed. In the framework of this survey, the paper industry, as part of production industry, has been more profoundly analysed, in order to find the level of understanding and use of the key performance indicators and KPI systems, as an example. Based on the elements revealed by this analysis, a KPIs - Model for processes, production, financials, quality, supply chain, human resources and innovation is developed. This KPIs - Model can be a basis for the development of further KPIs - Models by any interested company, based on its specific conditions.

A Model KPI Classification for manufacturing Industries:

Centre can be classified on the following basis:

- Quality
- Finance
- SDE
- SDE Purchase
- Purchase
- Program
- Production
- Team
- Safety
- HR
- Logistics

The KPI for each Centre can be identified as follows:

CENTRE	KPIs
1. Quality	• Supplier PPM • Green Channel Parts • All Customer PPM 6 • All Customer Incidents • In Process PPM 300 • MAFACT Sourcing Process Class • MAFACT Supplier Monitoring Class • MAFACT Production Class • MAFACT Logistics Class
2. Logistics	• Customer Delivery Performance • Inventory Discrepancy • Stock Turn Ratio (STR) • Premium Freight as of Sales% • Refresh Training to Logistics
3. SDE	• No. of. Incidents Per Month in QPF • Supplier Audit Assessment • Quality Improvement Projects
4. Purchase	• Deploy eRFX Overall Supplier Performance • Cost Reduction • Supplier Delivery Performance
5. Production	• Labour Cost • Production Schedule Adherence • OEE
6. Safety	• No.of.LTI(Lant Time Incidents) Safety Zero Incidents • Suggestions (1 Suggesstions/Employee/Month)
7. Finance	• Cost of Quality
8. SDE Purchase	• Supplier Overall Performance Rating
9. Program	• LRR
10. Team	• Operational Team Training
11. HR	• EOS

Table No: 1 –The Table showing the KPI

CONCLUSION

- Using KPI the performance may be analysed.
- A model for analysis of KPI can be constructed.
- KPI can be classified in the manufacturing company.

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