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## **INTRODUCING POWER BI-INTEGRATED HOSHIN KANRI MATRIXES FOR THE SAMPLE ROOM OPERATIONS IN THE APPAREL INDUSTRY**

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### **ABSTRACT**

*The apparel industry's sample room often faced challenges in performance management. Due to the lack of a performance management system, delays and quality issues have occurred, leading to customer dissatisfaction and reduced future opportunities. This research addressed these challenges by implementing a reliable performance management system using the Hoshin Kanri matrix integrated with Power BI. The study defined Key Performance Indicators using the Hoshin Kanri matrix as a strategic tool and visualized the performance using Power BI dashboards. The investigation used data after exploring a sample room operation in the apparel industry and acquiring experience with the process. Using a qualitative approach, this research helped apply theoretical knowledge to practical insights to optimize the sample room process. The analysis included applying the HK matrix to align operational objectives with relevant KPIs. The results highlighted that the linkage between the HK matrix and Power BI significantly improved the ability to monitor KPIs in real-time. After implementing this approach, the company was able to do real-time performance monitoring and provide key insights, guiding decision-makers to make the right decisions at the right time. Furthermore, ultimately it led to improved efficiency in the sample room, better customer satisfaction, and opportunities in the apparel industry, and finally improved the sample room performance. This study implied the importance of a proactive approach through the Power BI integrated HK matrix to maintain a competitive advantage, achieve organizational goals, and provide better service to customers.*

**Keywords:** Efficiency, Hoshin Kanri (HK) Matrix, Key Performance Indicators (KPIs), Power BI Dashboards, Sample Room

### **1. Introduction**

The sample room plays a vital role in managing samples, handling

customers, and providing proper feedback. Because of multiple customers, the sample room is quite busy and dealing with tight deadlines to keep proper relationships with customers. Customers assess the company with the desired outcome before confirming orders. Once the company cannot provide quality samples and fails to satisfy customers, the order will not be confirmed. Effective communication and providing necessary feedback are important between customers and the sample room of the factory (Khan & Islam, 2013).

KPIs, objectives, and key results are used to measure the performance of the sample room. Most of the research has been done regarding the financial impacts of KPIs limits supporting innovation and operational efficiency in the apparel industry (Al Thinyan, Ghawji, & Shehri, 2022). This research was focused on the benefits of KPIs aligned with the HK matrix and Power BI integration.

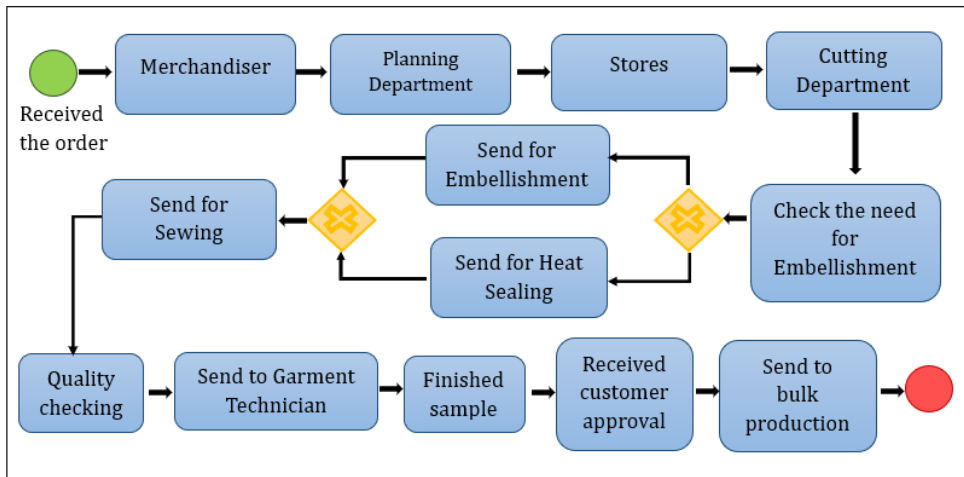
The apparel industry always looks to enhance operational efficiency and performance measurement. This research focused on Introducing Power BI integrated with the Hoshin Kanri matrix for the sample room operations in the apparel industry. From this study, Key Performance Indicators can be defined by using the Hoshin Kanri matrix and are visualized using Power BI dashboards. For that dashboard preparation, excel was used as a reference. This research filled the gap in literature because these kinds of exploration have not been done so far. The objectives of the research were:

- To apply the Hoshin Kanri matrix for sample room operations
- To Link the Hoshin Kanri matrix with Power BI dashboards
- To Create and analyze Power BI dashboards

First, it was essential to identify the process of a sample room. In the apparel industry, the sample room process begins once the merchandiser receives an initial order. Subsequently, the Bill of Material (BOM) is passed to the planner for scheduling. At that time, it delivers to sample room stores to check whether materials are available. Thereafter materials are sent to the cutting department to cut according to the specifications. Should a requirement arise for embellishment, after cutting fabric panels, send it to the companies that handle embellishment. In the absence of a requirement for embellishment, fabric panels are directly sent for heat sealing. Thereafter packages are sent to the sewing department. Whenever the samples are done, the quality checker inspects the samples to see whether they are in quality standard. At the point that all requirements are fulfilled, then proceed to bulk production. This process is shown in Figure 1.

Researchers have shown the importance of KPIs and measuring performance in different industries (Bhatti, Awan, & Razaq, 2014). For the apparel industry, research is limited, especially for sample room operations. However, there is some kind of research on the application in sample rooms in the apparel industry. The HK matrix has been

recognized for the alignment of strategic capabilities. But the matter is integrated with modern data visualization tools like Power BI remains



**Figure 1:** Sample Room Process.

underexplored. This research was built on existing research to give a framework to implement such kinds of tools for the apparel industry to support innovation and excellence of operation (M Sultan, 2022).

This study aligned theoretical approaches with practical applications. Data has been collected through a well-known apparel company in Sri Lanka. Data is collected through company records, primary resources such as interviews, and observations within the organization. The HK matrix has been used to identify and define relevant KPIs department-wise and individually. Then it was visualized and analyzed by using Power BI. This research followed the qualitative approach of the proposed framework.

By combining HK matrix and Power BI, the study is expected to give valuable insights into how sample rooms operate in the apparel industry. Findings highlighted by this method give useful information to improve performance measurement and align with better decision-making. Using the HK matrix and visualizing KPI measurements through dashboards was an interactive way to track and enhance the efficiency of operations of the sample room. This study introduced a new way to manage the performance of the sample rooms in the apparel industry. Therefore, this can be useful for other industries as well.

## 2. Literature Review

### 2.1 Performance Management & Evaluation

Currently, the organization is operating in a highly competitive market due to globalization and other factors. Along with the intense

competition between the organizations, organizations always strive to gain more competitive advantages than their competing organizations and others. Thus, effective performance management is a critical factor in achieving competitive advantages (Bhatti, Awan, & Razaq, 2013). Performance management can be explicitly described as “a goal-oriented process that aims to assure the performance and productivity of employees, teams, and also the whole organization.” (KARAHAN, 2017). Performance management consists of three main components. Especially key components included evaluation, training, and rewards.

Performance evaluation plays a major role in improving the quality of operational inputs of an organization, motivating employees by encouraging employees, and keeping employees engaged with operational activities and other activities. Both in terms of employee succession plans and as a whole, it leads to upgrades and increments for the organization as a whole (Shaout & Yousif , 2014). Performance evaluation can be described as “assessing performance through ground benchmarks and comparing tracked data to marked-up data whether the organization achieved the targeted position” (Needham & Boyle, 2003). Especially, two methods to evaluate performance are traditional and modern (Shaout & Yousif , 2014).

Performance measurement can be defined as “the process of quantifying or qualifying the performance of a product or organization” (Kalla, Silukb, Jacobi, & Saibt, 2015). To improve the performance of an organization, performance measures must be taken. It also helps in the goal-setting process of an organization (Kalla, Silukb, Jacobi, & Saibt, 2015). Moreover, the performance measurement and evaluation process guides manufacturing organizations to compare performance with different organizations in the industry, with plants, departments, teams, and individuals (Bhatti, Awan, & Razaq, 2013). The performance level of any unit or organization can be understood through performance evaluation and measurement, which are crucial for manufacturing organizations to gain a competitive advantage.

## **2.2 Performance Evaluation Methods**

Performance evaluation consists of two main approaches. Notably, the main factors are traditional methods and modern methods (Shaout & Yousif , 2014). Approaches vary depending on how employee performance is assessed, and what techniques are used. Employee performance must be evaluated before it can be improved, so performance evaluation methods are very important (Shaout & Yousif , 2014).

Traditional performance evaluation methods are used to evaluate past performance of the organization over a fixed period of time. Examples of traditional methods are Ranking methods, Graphic rating scales, critical Incident methods, and narrative essays (Shaout &

Yousif , 2014). This can be described as a past-oriented approach because it is based on past data.

Modern methods were created to improve traditional methods by overcoming their weaknesses. In this way, weaknesses like bias & subjectivity were minimized (Shaout & Yousif , 2014). Through these modern methods, the organization's performance is also intended to be aligned with the organization's long-term goals. Examples of modern methods are management by objectives (MBO), Behaviorally Anchored Rating Scales (BARS), Key Performance Indicators (KPIs), and Assessment centers, 360 degrees and 720 degrees (Shaout & Yousif , 2014).

### **2.3. KPIs and Key Performance Matrix**

Performance indicators can be defined as physical values that are used to measure the overall performance of any organization, to make comparisons between competitive organizations within the organization and outside it, and to be used for management purposes (Bhatti, Awan, & Razaq, 2013). These performance indicators are cost, finance, quality, delivery reliability, flexibility, employee satisfaction, and customer satisfaction. Through these indicators, it is important to measure the efficiency of an organization covering various aspects such as operational efficiency, employee engagement, financial improvement, and customer loyalty (Bhatti, Awan, & Razaq, 2013).

When discussing KPIs, there is a special concern about the apparel industry. Especially because it is a manufacturing industry. To increase the efficiency of an apparel company's operations and to achieve long-term goals, the entire organization needs to have KPIs for each department and each employee. According to research done on defining KPIs in the luxury fashion industry, KPIs have been developed considering broad aspects such as lead time, service levels, and production efficiency in different stages of the apparel company in the research provided in preparing this research (Bindi, Bandinelli, Fani, & Paola Pero, 2023). Literature such as "Key Performance Indicators (KPIs) for Sustainable Manufacturing Evaluation in Apparel Sector" has highlighted the sustainable production of the garment sector while also focusing on the development of KPIs suitable for the apparel industry (LuthfurRahmam, Uddin, Karim, & Paul, 2022).

### **2.4. Hoshin Kanri Matrix**

The HK matrix is used to define KPIs in the sample room and the research provided by the literature has extensively studied the application of AHP to the classification and prioritization of inventory products using the AHP method.

HK matrix is intended to be used when defining KPIs in the sample room. This process effectively manages the day-to-day

operations of the sample room and provides a tool to achieve the organization's long-term objectives. While this HK matrix focuses on measurable outcomes, it also focuses on continuous monitoring. While processing the matrix is divided into 4 key quadrants ( Da Silveira, de Lima, Deschamps, & da Costa, 2018). Namely, we can indicate it as long-term goals (south), Annual objectives (west), Top level priorities (North), and Metrics to improve (east).

The purpose of this research was to address this gap by developing and evaluating KPIs for optimizing the production process in the early stages. Moreover, to monitor real-time data and to make decisions for the future survival of the business, developing a KPI dashboard using data analysis tools in the new trend such as Power BI, a feature not covered in the existing literature.

### **3. Methodology**

Empirical research involves observation, experimentation, and data collection from real-world settings to solve specific, practical problems. This research was designed as a qualitative case study because,

- I. An exploratory study that addresses a "how" research issue is especially well-suited for a case research approach (Tim, Pan, Bahri, & Fauzic, 2017).
- II. It offers a chance to create rich descriptions and profound insights for increasingly relevant topics when a comprehensive comprehension of the phenomenon is required. Creating detailed ( White, Nielsen, & Valentini, 2017) descriptions is crucial because it enables researchers to extract subtleties and complexity from the phenomenon.

In the context of this study concentrates on optimizing the sample room procedure in apparel industry businesses ( Silva & Ratnayake, 2022). The analysis of the intricate constitution, reconstruction, and recurring enactment of technological systems is in practice.

They used the HK matrix ( Liu , Xue , & Chen , Development of a metric system measuring infrastructure sustainability: Empirical studies of Hong Kong, 2021) to establish Key Performance Indicators ( Spahija, Shehi , & Guxho, 2012) and build dashboards to gain valuable insights and take meaningful actions. By utilizing qualitative research methods, we can capture detailed insights and gain a thorough understanding of sample room processes, which will ultimately improve the efficiency and effectiveness of operations.

#### **1.1. Research Design**

This research used a qualitative research design to investigate and comprehend sample room procedures in the apparel sector through the use of a case study technique. Key Performance Indicators (KPIs) for each sample room involved were developed using the HK matrix as a

theoretical lens. To obtain comprehensive qualitative insights, the research design enabled a thorough examination of the operating procedures. Through iterative assessments and modifications based on actual data gathering and analysis, the design enabled gains in sample room efficiency by concentrating on KPIs and performance dashboards. Interviews were conducted with the key employees of the sample room to establish potential KPIs of the sample room. A two-step validation procedure was implemented to ensure the accuracy of the data gathered. At first, interview data was organized using an Excel sheet that recorded terms discussed, employee sorting, position, and interview time. To guarantee accuracy and consistency, a second round of interviews was conducted after the initial round of data gathering. A pilot study was started after this validation to evaluate the preliminary results and further improve the KPIs.

**Table 1:** Validation Table.

| No | Designation | Interview time     | Interview terms |
|----|-------------|--------------------|-----------------|
| 1  | Manager 1   | 10.00 AM -10.30 AM | 1               |
| 2  | Operation 1 | 2.00 PM - 2.45 PM  | 1               |

The iterative nature of the research approach allowed for ongoing improvement in response to data gathering and pilot testing outcomes. To facilitate real-time monitoring and operational improvement, Power BI dashboards were created to show the KPIs and offer actionable insights into sample room performance. This approach allowed the study to find ways to increase the sample room process's efficiency over the long and short term.

## 1.2. Data Collection

In late 2023, the procedure of gathering data was initiated. The first stage of data collection was gathering relevant documents and scheduling meetings with department managers and top-level management about sample room data collection for KPI defined at Sri Lankan textile enterprises.

Data collection can be used in formal and informal methods (Azuah, 2022), formal method data is mainly used for the decision-making process, and informal data helps to support the formal data decision-making process. Semi-structured interviews were conducted as the primary data collection method. Also, guiding questionnaires were used in interviews to optimize data collection.

An Excel sheet has been prepared including all the KPIs that are aligned with the department-level objectives, This Google Excel sheet (Mernagh & Kevin, 2014) mainly focuses on samples in time, out time, and in and out dates in the sample room process. By using that information has calculated cycle time. It represents the time that a

sample spends in each department. And also, it includes downtimes and quality faults. Likewise collected numerical data. By using those data within a randomly selected one-week time, a specific sample population.

### **1.3. Data Analysis**

Information was gathered for the data analysis part of this study through observations and interviews (CRUZ & BERROL, 2011), validated the data in Excel tables. Then started the KPI designing and creating process using the HK matrix as a theoretical Lense and a guiding tool, (Benjamin Lignugaris/Kraft , Nancy Marchand-Martella,, & Ronald C. Martella, 2000) annual and long-term objectives using these data. The analysis started by ranking the primary tasks in the sample room. Next, KPIs were identified for every task by various sample room departments. After that, a responsible individual was designated to oversee these tasks in each department. Correlations were found between KPIs and determined the fundamental linkages between short- and long-term goals. The results of this correlation analysis, which was carried out with the HK matrix, were collated into an Excel spreadsheet. The KPIs and their relationships were visualized on a Power BI dashboard that we created using this Excel data, giving the sample room operations clear and useful information. Then a pilot trial for one month was carried out to validate the industrial application of the proposed solution. During that trial, we reviewed the performance weekly, and daily and adjusted developed KPIs based on industry requirements. And held interviews with direct industry participants after the month trial ended to validate the developed KPIs and dashboards.

## **4. Results/Analysis and Discussion**

The analysis and discussion part explains the findings regarding the study of integrating the Hoshin Kanri matrix with Power BI for sample room operations in the apparel sector. The discussion leans towards how this integration was instrumental in achieving the research objectives.

### **4.1. Objectives**

#### **4.1.1. Objective 1: To Apply the Hoshin Kanri Matrix for Sample Room Operations**

The first step of the study was to apply the Hoshin Kanri to sample room operations as a guiding framework and theoretical lens of this research and it was considered as the base tool for the study, referring to that tool the sample room application was adjusted according to the Sample Room operations. The application/implementation process involved many steps. The process started with identifying long-term goals for the sample room process after a thorough analysis of interviews of persons involved with the sample room process, observations, and annual reports of apparel organizations in Sri Lanka. Then based on the long-



term goals and annual objectives were defined. The next step was deciding top-level priorities and strategies that specified how the annual goals were going to be achieved. Then identified responsibilities and established KPIs and measurement units. Then Hoshin Kanri matrix adapted to the operations of sample rooms was developed, addressing KPIs at overall, department, and job levels which would help determine whether the implemented strategies accomplished the objectives and goals.

#### 4.1.2. Objective 2: To Link Hoshin Kanri Matrix with Power BI Dashboards

The second objective was to connect the Hoshin Kanri matrix with Power BI to track performances in real time. The Hoshin Kanri matrix needed to be converted to a tabular format using Microsoft Excel for easy connection with Power BI. The format included strategic objectives, annual objectives, improvement priorities, responsible departments/persons, KPI metrics, target values, actual values, and progress calculations based on the formula:

$$(\text{Actual Value}/\text{Target Value}) \times 100\%.$$

This table was then imported into Power BI to produce interactive dashboards for real-time tracking of current performance metrics.

**Table 2:** The Format of the Table.

| Strategic objective | Annual objective | improve ment priority | Responsible department / person | KPI Metric/ Metrics to improve | Target Value/ Bench marks | Actual Value | Pro gre ss |
|---------------------|------------------|-----------------------|---------------------------------|--------------------------------|---------------------------|--------------|------------|
|                     |                  |                       |                                 |                                |                           |              |            |

#### 4.1.3. Objective 3: To Create and Analyze Power BI Dashboards

The final objective was the design and analysis of a set of Power BI dashboards, such as a Performance Dashboard that would reflect time-based monitoring of KPIs, an Operational Dashboard for daily operational metrics, and a Strategic Dashboard, which would allow an overview of strategic initiatives and progress at the firm. These might include real-time insights into decision-making by stakeholders in this instance.

#### 4.2. Discussion

The integration of the Hoshin Kanri matrix with Power BI could improve the effective management and performance of Sample Room operations since stakeholders could track KPIs and operational metrics in real-time, enabling timely responses to emergency issues and enhancing strategic and operational decision-making.

#### **4.2.1. Validating the Industrial Application of the Proposed Solution**

Then a one-month pilot trial was conducted, and the proposed solution was implemented within the real-world Sample Rooms in the Sri Lankan Apparel industry that were used to collect data for the study. During the pilot trial, adjustments and improvements were made based on reviews, and comments gathered from the industry. Further, at the end of the pilot trial conducted interviews with Sample room managers and sample room operators had participated in the trial and finally validating the industrial application of the proposed solution. Empirical evidence from Power BI dashboards showed a 7% enhancement in operational efficiency and a 4% reduction in sample delivery times over one month, aligning with the goals identified in the Hoshin Kanri matrix.

However, limitations were observed, such as the reliance on accurate and consistent data input in Power BI, customization challenges for organizations, and the high initial effort required for effective integration of Hoshin Kanri with Power BI.

#### **4.2.2. Benefits**

- Real-time tracking of data for improved decision-making
- Improved operational efficiency and sample delivery times
- Continuous monitoring of strategic goals

#### **4.2.3. Disadvantages and Limitations**

- Reliance on accurate and consistent data input
- Customization challenges for organizations
- High initial effort is required for effective integration

Despite these limitations, the integration of classic strategic planning methodologies with modern data visualization tools has provided a flexible and effective solution for managing sample room operations in the apparel industry. Future research could explore advanced customization of Power BI dashboards and examine applications in other industries.

### **5. Conclusion and Implications**

The study demonstrates that integrating the Hoshin Kanri matrix with Power BI dashboards improves performance in sample room operations of the apparel industry. Real-time tracking of KPIs enables better decision-making, enhancing operational efficiency. The analysis of key performance metrics, such as efficiency and delivery time, validates the effectiveness of this integration.

The present study proved that integrating the Hoshin Kanri matrix with Power BI dashboards constituted an effective strategy for improving sample room operations performance within the apparel industry. These suggested that the application of KPIs, in addition to the

application of data visualization tools, had positive effects on both decision-making and operational efficiency. For example, according to the empirical data on the Power BI dashboards, key performance indicators included a 7% increase in operational efficiency and a 4% reduction in sample delivery time within one month.

HK Matrix gave a very sound skeleton on which the definition and tracking of KPIs would take place, which had to do with the achieving of strategic objectives. However, there were setbacks, especially regarding individual needs for customization across organizations. Every company has diverse needs, each requiring specialized ways of approaching. Besides, the effectiveness of Power BI depended on correct and consistent data entries. Inadequate quality of data negated the reliability of insights achieved through various visualizations.

While the previous research had established a theoretical basis for the HK Matrix application in strategic planning and operative management, the practical integration of the HK matrix with Power BI, as demonstrated in this work, took considerable effort. This approach, though challenged, showed flexibility and effectiveness in operational performance improvement. It allowed the timely delivery of samples and ensured customers' satisfaction, thus raising the overall performance of operations. The use of Power BI dashboards would mean, in turn, a company was able to view performance in real-time and offer greater flexibility and quick reactions toward eventual changes. The present work underlined how the use of classic strategic tools, such as the HK matrix combined with modern data visualization platforms, offers a way toward continuous operational improvement.

Future this research could expand by further looking into more customized applications of the HK matrix and Power BI, especially other than for industries related to apparel or manufacturing. Further advanced capabilities of data visualization tools could be explored for overall efficiency in this approach to achieving operational and strategic objectives.

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