## Higher Nationals

Internal verification of assessment decisions – BTEC (RQF)

| | | | |
|---|---|---|---|
| **INTERNAL VERIFICATION – ASSESSMENT DECISIONS** | | | |
| **Program title** | HND in Computing | | |
| **Assessor** | | **Internal Verifier** | |
| **Unit(s)** | **Unit 14: Business Intelligence** | | |
| **Assignment title** | Applying BI solutions to enhance and improve business operations | | |
| **Student's name** | Ryan Wickramaratne | | |
| **List which assessment criteria the Assessor has awarded.** | **Pass** | **Merit** | **Distinction** |
| | | | |

| **INTERNAL VERIFIER CHECKLIST** | | |
|---|---|---|
| **Do the assessment criteria awarded match those shown in the assignment brief?** | Y/N | |
| **Is the Pass/Merit/Distinction grade awarded justified by the assessor's comments on the student work?** | Y/N | |
| **Has the work been assessed accurately?** | Y/N | |
| **Is the feedback to the student:**<br>Give details:<br>• Constructive?<br>• Linked to relevant assessment criteria?<br>• Identifying opportunities for improved performance?<br>• Agreeing actions? | <br><br>Y/N<br>Y/N<br>Y/N<br>Y/N | |
| **Does the assessment decision need amending?** | Y/N | |

| | | | |
|---|---|---|---|
| **Assessor signature** | | **Date** | |
| **Internal Verifier signature** | | **Date** | |
| **Programme Leader signature** (if required) | | **Date** | |

| Confirm action completed | | | |
|---|---|---|---|
| **Remedial action taken** Give details: | | | |
| **Assessor signature** | | **Date** | |
| **Internal Verifier signature** | | Date | |
| **Program Leader signature** (if required) | | Date | |

# Higher Nationals - Summative Assignment Feedback Form

| | | | |
|---|---|---|---|
| **Student Name/ID** | Ryan Wickramaratne (COL 00081762) | | |
| **Unit Title** | Unit 14: Business Intelligence | | |
| **Assignment Number** | | **Assessor** | |
| **Submission Date** | 25/2/2023 | **Date Received 1st submission** | |
| **Re-submission Date** | | **Date Received 2nd submission** | |

**Assessor Feedback:**

**LO1 Discuss business processes and the mechanisms used to support business decision-making.**

**Pass, Merit & Distinction Descripts** **P1** ☐ **M1** ☐ D1 ☐

**LO2 Compare the tools and technologies associated with business intelligence functionality.**

**Pass, Merit & Distinction Descripts** **P2** ☐ **M2** ☐ D2 ☐

**LO3 Demonstrate the use of business intelligence tools and technologies**

**Pass, Merit & Distinction Descripts** **P3** ☐ **P4** ☐ **M3** ☐ **D3** ☐

**LO4 Discuss the impact of business intelligence tools and technologies for effective decision-making purposes and the legal/regulatory context in which they are used.**

**Pass, Merit & Distinction Descripts** **P5** ☐ **P6** ☐ **M4** ☐ **D4** ☐

| | | |
|---|---|---|
| **Grade:** | **Assessor Signature:** | **Date:** |
| **Resubmission Feedback:** | | |
| **Grade:** | **Assessor Signature:** | **Date:** |
| **Internal Verifier's Comments:** | | |
| **Signature & Date:** | | |

* Please note that grade decisions are provisional. They are only confirmed once internal and external moderation has taken place and grades decisions have been agreed at the assessment board.

| Assignment Feedback<br>**Formative Feedback: Assessor to Student** |
| --- |
| **Action Plan** |
| **Summative feedback** |
| **Feedback: Student to Assessor** |

| | | | |
| --- | --- | --- | --- |
| **Assessor signature** | | **Date** | |
| **Student signature** | | **Date** | |

# Pearson Higher Nationals in

# Computing

Unit 14: Business
Intelligence Assignment 01

## General Guidelines

1. A Cover page or title page – You should always attach a title page to your assignment. Use previous page as your cover sheet and make sure all the details are accurately filled.
2. Attach this brief as the first section of your assignment.
3. All the assignments should be prepared using a word processing software.
4. All the assignments should be printed on A4 sized papers. Use single side printing.
5. Allow 1" for top, bottom , right margins and 1.25" for the left margin of each page.

## Word Processing Rules

1. The font size should be **12** point, and should be in the style of **Time New Roman**.
2. **Use 1.5 line spacing**. Left justify all paragraphs.
3. Ensure that all the headings are consistent in terms of the font size and font style.
4. Use **footer function in the word processor to insert Your Name, Subject, Assignment No, and Page Number on each pag**e. This is useful if individual sheets become detached for any reason.
5. Use word processing application spell check and grammar check function to help editing your assignment.

## Important Points:

1. It is strictly prohibited to use textboxes to add texts in the assignments, except for the compulsory information. eg: Figures, tables of comparison etc. Adding text boxes in the body except for the before mentioned compulsory information will result in rejection of your work.
2. Avoid using page borders in your assignment body.
3. Carefully check the hand in date and the instructions given in the assignment. Late submissions will not be accepted.
4. Ensure that you give yourself enough time to complete the assignment by the due date.
5. Excuses of any nature will not be accepted for failure to hand in the work on time.
6. You must take responsibility for managing your own time effectively.
7. If you are unable to hand in your assignment on time and have valid reasons such as illness, you may apply (in writing) for an extension.
8. Failure to achieve at least PASS criteria will result in a REFERRAL grade .
9. Non-submission of work without valid reasons will lead to an automatic RE FERRAL. You will then be asked to complete an alternative assignment.

10. If you use other people's work or ideas in your assignment, reference them properly using HARVARD referencing system to avoid plagiarism. You have to provide both in-text citation and a reference list.
11. If you are proven to be guilty of plagiarism or any academic misconduct, your grade could be reduced to A REFERRAL or at worst you could be expelled from the course.

**Student Declaration**

I hereby, declare that I know what plagiarism entails, namely to use another's work and to present it as my own without attributing the sources in the correct form. I further understand what it means to copy another's work.

I know that plagiarism is a punishable offence because it constitutes theft.

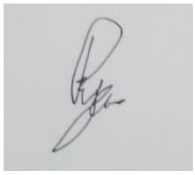
I understand the plagiarism and copying policy of Edexcel UK.

I know what the consequences will be if I plagiarize or copy another's work in any of the assignments for this program.

I declare therefore that all work presented by me for every aspect of my program, will be my own, and where I have made use of another's work, I will attribute the source in the correct way.

I acknowledge that the attachment of this document signed or not, constitutes a binding agreement between myself and Pearson UK.

I understand that my assignment will not be considered as submitted if this document is not attached to the assignment.



25/2/2023

ryandilthusha@gmail.com

**Student's Signature:** **Date:**

**(*Provide E-mail ID*)** **(*Provide Submission Date*)**

# Higher National Diploma in Business

## Assignment Brief

| | |
|---|---|
| Student Name /ID Number | Ryan Wickramaratne (COL 00081762) |
| **Unit Number and Title** | **Unit 14 : Business Intelligence** |
| Academic Year | 2021/2022 |
| Unit Tutor | Ms. Sumudu |
| **Assignment Title** | **Business Process Support Mechanisms** |
| Issue Date | |
| Submission Date | 25/2/2023 |
| IV Name & Date | |

**Submission format**

The submission should be in the form of an individual written report. This should be written in a concise, formal business style using single spacing and font size 12. You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced. Follow Harvard referencing system for in-text citations, reference list and the bibliography.. The recommended word limit is 4,000–4,500 words, although you will not be penalised for exceeding the total word limit.

**Unit Learning Outcomes:**

LO1 Discuss business processes and the mechanisms used to support business decision-making.

LO2 Compare the tools and technologies associated with business intelligence functionality

LO3 Demonstrate the use of business intelligence tools and technologies

LO4 Discuss the impact of business intelligence tools and technologies for effective decision-making purposes and the legal/regulatory context in which they are used

**Assignment Brief and Guidance:**

Data and information are core to any organizational business process. Meaningful information is a necessity to drive profitable business actions. The concept of Business Intelligence (BI) has evolved through technologies such as Decision Support Systems (DSS) to a number of tools, technologies, architectures and methods which involves data cleaning, data integration, data mining, data evaluation and data representation. Hence BI can be identified as a software suite of software and services to transform data into actionable intelligence and knowledge.

**Scenario**

Yard of Ale is a large-scale brewery in Sri Lanka and well establish company control 20% market share of beer market which is the 2nd biggest market share from entire beer market. The company have automated production line include mills, Brewhouse and bottling plant and each control by separate embedded software system not allowed to access operational data stores but can be configured to generate CSV or excel operational data file at the end of each batch. The company consists of multiple departments responsible for each operations of the organization such as Production, Engineering, HR/Legal, finance, Sales and marketing, Procurement, Administration, Quality control, Research and development, IT and each and every department have its own operational systems to record keeping purposes and each operational application software developed by professionally. Each department manages by a department manager. For an example, production department manages by the production manager and he is responsible for manage all production related operations in sub departments. Mills ,Brewhouse ,Bottling plant, raw material and finish products stores and each sub department managed by operational manager. This hierarchical configuration replicates throughout most of the department. Upper management of brewery required to consolidate all these data in to one data warehouse with the data contain in the legacy system as well. Other than that upper management required to incorporate every external data about company and products from various data collection and research

agencies the business intelligent system. Those external data available as JSON/XML data files, plain text reports, social media comments/posts and all negative and positive online comments about organization and products.

Upper management of company believe more you know about organization and the external environment you have better completive advantage. Have potential to control bigger market share and effectively become number 1 beer in Sri Lanka

**Task 1**

Analyse the business processes and the supporting processes of the organization given in the scenario and differentiate between semi structured and unstructured data. Evaluate the benefits and drawbacks of using application software to handle the business processes in Yard of Ale.

**Task 2**

Compare how strategic, tactical and operational decisions are supported within the organization for business decision making process. You have to furthermore compare and contrast how various information systems (TPS,MIS,DSS) could be utilized to enhance those decisions with related to key features of BI framework . Justify your answer with relevant to the functionalities of business intelligence.

**Task 3**

Chief Engineer is the tactical manager of engineering department who oversees all repairs and maintenance of the total eight sectors of the factory that include water purification plant, Mill, Brewhouse, bottling plant, waste treatment plant, factory maintenance and repair/ fabrication shop. Each sector consists of two or more sub sectors and each subsector have 4- 10 of machines. Chief engineer requires to track the maintenance and repair all the machineries with minimal disruption to production and he must maintain healthy inventory of spare parts which consist of over 5000s

items, track the progress of every jobs, Identify problematic arias, Track engineers and mechanics work logs and efficiency and monitor system downtime.

3.1. Explain what business intelligence is and the tools and technologies associated with it by taking relevant examples to the organization given in the scenario.

3.2. Design a Managerial dash board for chief engineer using various data visualizations methodologies that includes 6-8 widgets to present required information. Apply appropriate customizations that can utilize to improve the managerial dashboard designed above . Critically evaluate how your Dashboard design and the suggested enhancement could optimize chief engineer's performance by delivering accurate and reliable information to increase his effectiveness.

**Task 4**

4.1. Discuss how organizational decision-making process can be improved by implementing business intelligence tools. Conduct a research to identify the organizations that have utilized new business intelligent innovations and trends to improve their performance and to extend BI systems to target audience, provide better competitive advantage within the market.

4.2. Sharing data within the organization through a BI tool can raise legal, ethical and professional concerns. Explore the legal issues that may result when using business intelligence tools (Eg: Data protection laws, Cyber security, etc.) and evaluate how the chosen organization and extend the target audience / gain a competitive advantage by securely exploiting Business Intelligence tools.

**Grading Rubric**

| Grading Criteria | Achieved | Feedback |
|---|---|---|
| **LO1 Discuss business processes and the mechanisms used to support business decision-making.** | | |
| **P1** Examine, using examples, the terms 'Business Process' and 'Supporting Processes'. | | |
| **M1** Differentiate between unstructured and semi-structured data within an organisation. | | |
| **D1** Evaluate the benefits and drawbacks of using application software as a mechanism for business processing. | | |
| **LO2** Compare the tools and technologies associated with business intelligence functionality | | |
| **P2** Compare the types of support available for business decision-making at varying levels within an organization. | | |
| **M2** Justify, with specific examples, the key features of business intelligence functionality. | | |
| **D2** Compare and contrast a range of information systems and technologies that can be used to support organisations at operational, tactical and strategic levels. | | |
| **LO3 Demonstrate the use of business intelligence tools and technologies** | | |
| **P3** Determine, with examples, what business intelligence is and the tools and techniques associated with it. | | |
| **P4** Design a business intelligence tool, application or interface that can perform a specific task to support problem-solving or decision-making at an advanced level. | | |
| **M3** Customise the design to ensure that it is user friendly and has a functional interface. | | |
| **D3** Provide a critical review of the design in terms of how it meetsa specific user or business requirement and identify | | |

| | | |
|---|---|---|
| what customisation has been integrated into the design. | | |
| **LO4 Discuss the impact of business intelligence tools and technologies for effective decision-making purposes and the legal/regulatory context in which they are used** | | |
| **P5** Discuss how business intelligence tools can contribute to effective decision-making.<br>**P6** Explore the legal issues involved in the secure exploitation of business intelligence tools. | | |
| **M4** Conduct research to identify specific examples of organisations that have used business intelligence tools to enhance or improve operations | | |
| **D4** Evaluate how organisations could use business intelligence to extend their target audience and make them more competitive within the market, taking security legislation into consideration. | | |
| | | |

## Acknowledgement

I would like to express my special thanks of gratitude to my BI lecturer Mrs. Sumudu for providing invaluable guidance and giving immense amount of knowledge to work on this assignment perfectly. I specially thanks her because he helped us in doing a lot of research and I came to know about so many new things about the Business Intelligence.

Secondly, I would like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

## Executive Summery

Yard of Ale is a beverage company that could profit from putting in place business intelligence solutions to support its operational procedures. The company gathers both structured and unstructured data, and it is possible to manage business operations using application software. Gathering, analyzing, and transforming data into useful insights requires a collection of tools and technology known as business intelligence. The company can assist strategic, tactical, and operational decision-making processes by utilizing TPS, MIS, DSS and ESS.

A managerial dashboard for the chief engineer can be created using many data visualization approaches, including widgets to display the necessary information. BI tool implementation can boost an organization's decision-making process and give it a competitive edge. To effectively use BI tools, however, it is important to address any legal, ethical, and professional issues that may arise from exchanging data across the business using a BI tool. In summary, Yard of Ale may make better decisions, work more efficiently, and perform at their best by using business intelligence technologies effectively.

# Abbrevations

Original Equipment Manufacturer (OEM)

Extensible Markup Language (XML)

Structured Query Language (SQL)

Extended Online Analytic Processing (XOLAP)

Resource Description Framework (RDF)

Operating System (OS)

Personal Computer (PC)

Application software (App)

Enterprise resource planning (ERP)

Artificial Intelligence (AI)

Customer Relationship Management (CRM)

Geographic Information System (GIS)

Customer Relationship Management (CRM)

General Data Protection Regulation (GDPR)

Online Analytical Processing (OLAP)

Transaction Processing Systems (TPS)

Management Information Systems (MIS)

Decision Support Systems (DSS)

Executive Support Systems (ESS)

Student Management Information System (SMIS)

key performance indicators (KPIs)

United Parcel Service (UPS)

Artificial Intelligence (AI)

Key Performance Indicator (KPI)

Structured Query Language (SQL)

Extract, Transform, Load (ETL)

Natural Language Processing (NLP)

Overall Equipment Effectiveness (OEE)

General Data Protection Regulation (GDPR)

European Union (EU)

California Consumer Privacy Act (CCPA)

Personal Information Protection and Electronic Documents Act (PIPEDA)

Personal Data Protection Act (PDPA)

Lei Geral de Proteção de Dados Pessoais (LGPD)

United Kingdom (UK)

APPs (Australian Privacy Principles)

Computer Fraud and Abuse Act (CFAA)

Credit Card Accountability Responsibility and Disclosure (CARD)

Payment Card Industry Data Security Standard (PCI DSS)

New York Shipping Exchange (NYSHEX)

Amazon Web Services (AWS)

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# Analyzing the concepts "business process" and "supporting processes" using examples

## 1.1 Business Process

### 1.1.1 Definition of Business Process

A business process is a collection of tasks that must be carried out to accomplish an organizational objective, frequently by numerous employees from various departments. Business processes can be simple or complicated; simple processes frequently take fewer stages to complete, whereas complex processes not only require more steps but are also more likely to require business rules to be followed. To ensure that processes are carried out effectively and offer value to the business and its customers, process documentation specifying who is accountable for each stage and what is expected of them is essential.

The following advantages are made possible by our understanding of how every business process within the organization functions from beginning to end.

- Boost operational effectiveness: We can find bottlenecks and inefficiencies and make adjustments to alleviate them by identifying each of the activities that make up a business process.
- Reduced operational expenses: We may boost productivity and cut costs by identifying which processes are not adding value and eliminating them.
- Minimize errors: The risk of errors is decreased, and process execution is made simpler by clearly specified repeated actions.
- Boost agility: We can adapt to market changes and do so more rapidly if we are aware of the points in a process when modifications must be made.
- Process performance measurement: Understanding how business processes should operate makes it possible to assess if they are performing at their highest level of efficiency.
- Encourage collaboration: Employee collaboration and reduction of duplication are facilitated by making it clear who is responsible for what within a process.

- Standardization: Clarity is increased, and the procedure is conducted consistently and correctly owing to standardization.

(Bunce, 2021)

## 1.1.2 Steps of Business Process

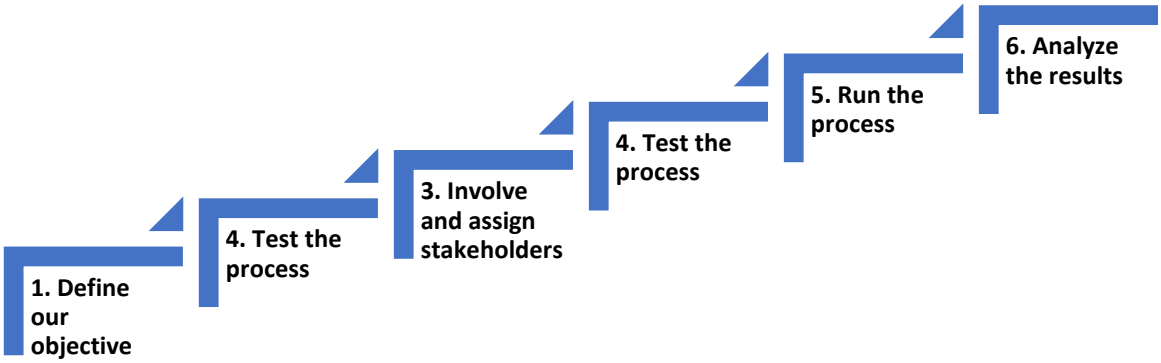



*Figure 1. 1 Steps of Business Process*

Business procedures have a few steps. Although we have built these stages after examining several ideas and our business operations, there is no one universal rule that we must abide by.

### 1. Define our objective

Business processes require us to be clear about the results we want to achieve as every process does. This would enable us to lay the groundwork for our procedure and give it an appropriate course of action. Add some numerical metrics to our goal so that we can evaluate the outcome after execution.

Ex:- Since “Yard of Ale” is a beverage company, they have a distribution procedure, and we want to set up a delivery team business process. Our objective is to have each of our delivery men travel to the targeted destination in no more than 30 minutes. To accomplish this goal, we must define it and follow all necessary procedures.

**2. Creating and analyzing alternatives**

Half of the issue is resolved once we have clearly specified the result we want. Therefore, we must come up with every possible possibility. Each of these options comes with the potential loss of an opportunity. The goal is to identify the solution with the lowest opportunity cost that still meets our needs.

Ex:- There are several ways to reduce the amount of time our beverage delivery boys spend travelling, such as splitting them into shifts, providing them with suitable vehicles, and designing their routes so they don't need to detour, but only a select handful of them will be appropriate and practical. Pick the best option from the selection.

**3. Involve and assign stakeholders**

This is among the most important steps in developing a business process. Once the process has been created using all the options, everyone must be included and made aware of the procedure. They play a key role in how the procedure is carried out. They must therefore be aware of every step of the procedure, which is vital. Long-term time savings would result from doing this.

Ex:- The HR team, the financial department, the production team, supervisors, and every other stakeholder must involve in this beverage distribution process.

**4. Test the process**

We must test the method on a lesser scale when it has been fully designed. We could fill up the gaps we missed when developing the procedure with the use of practical experience. With the right answers, we can close these tiny gaps and formalize our procedure.

Ex:- The approach was to deliver beverage to smaller retailers using smaller, quicker vehicles such as vans. So, a small, specifically focused area was chosen to evaluate the chosen strategy.

**5. Run the process**

We should apply the procedure to our business after addressing all of the gaps and minor irritations. Since the process's stakeholders are aware of it, the likelihood of errors will be greatly decreased.

**6. Analyze the results**

We had an objective in mind when we created the procedure. After putting it into practice, we must consider whether we were successful in getting the intended results. We must make a comparison between the current process and the previous one. We could use the quantitative metric to our advantage here.

Ex:- Our delivery man's time before and after the process deployment can be compared. This would enable us to determine whether or not we were successful in achieving the anticipated outcomes.

**Following is example of Business process for Yard Ale Beverage company using above key 6 steps.**

**1) Objective :**

- In the following quarter, increase sales revenue by 20% by improving the ordering procedure.
-

**2) Alternatives :**

- Build a system for online ordering.
- Employ more employees to deal with orders received via phone and in person.
- Provide discounts to clients who place larger orders.

**3) Stakeholders :**

- Order management and tracking will be handled by the sales team.
- The online ordering system will be created and implemented by an IT team.
- The financial team will assess the effect on revenues and costs.
- Consumers who will use the new ordering process.

**4) Testing :**

- Perform a small group of consumer pilot tests to ensure the online ordering mechanism is user-friendly and efficient.
- Train employees in the new procedure so they can handle the increased orders.

**5) Running the process :**

- Deploy the online ordering system and use marketing to advertise it to customers.
- To evaluate the efficacy of the new process, keep an eye on sales revenue and customer reviews.

**6) Analyzing the results :**

- Evaluate sales income to see if the 20% increase goal was met.
- To find out where the ordering process needs to be improved, get customer input.

- To ensure profitability, consider the impact on costs and make any necessary adjustments.

### 1.1.3 Types of Business Process

According to Mark Von Rosing of The Complete Corporate Process Handbook: Body of Knowledge from Process Modeling to BPM, business processes should be organized into three categories.

1. Operational process
2. Supporting process
3. Management process

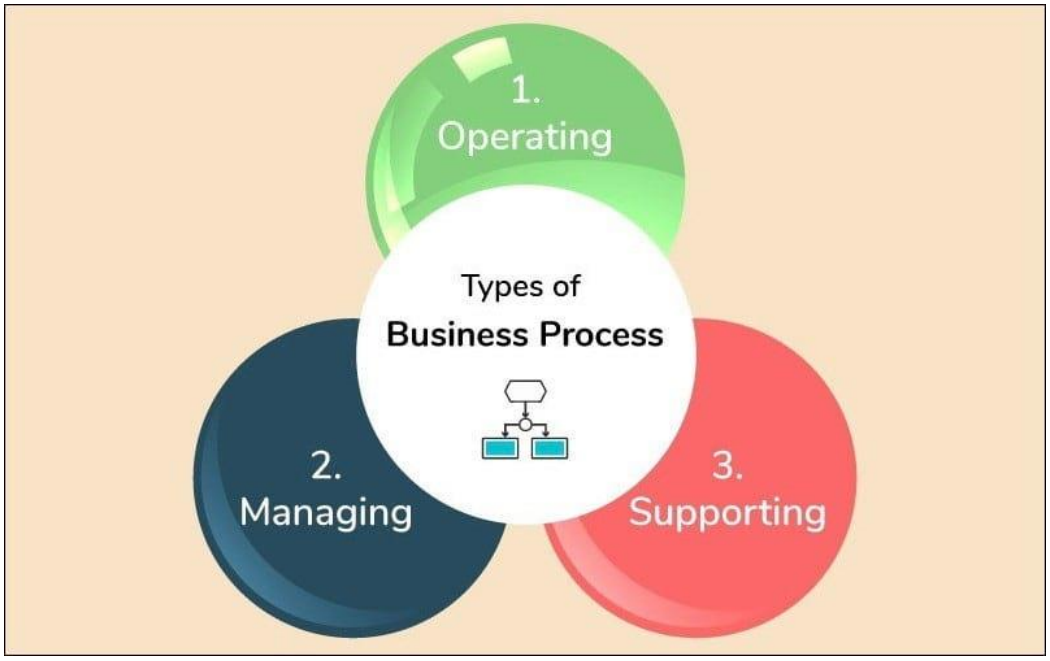



*Figure 1. 2 Types of Business Process*

**1. Operating Process (Core Process)**

These are the company's primary operations. The core values, vision, and mission of the company are intimately tied to these procedures. They are also referred to as fundamental processes. These procedures require further attention because they are the company's main sources of income. It's crucial to close the gaps and make the required adjustments

to these procedures. It will directly affect the expansion of the business once we have finished evaluating these procedures.

Ex:- The three steps in the McDonald's restaurant operation include receiving orders, preparing the food, and serving the customers.

**2. Managing Process**

Managing processes refers to the procedures used to plan, arrange, coordinate, and oversee all corporate operations. These procedures have objectives in mind. It involves assisting and inspiring the team to meet its objectives. These procedures also assist in establishing a course for the company's future expansion. These operations include regulating routine duties, instructing staff on how to do jobs well, introducing a new product, etc.

Ex:- In most management procedures, CEOs, managers, and upper management are involved.

**3. Supporting Process**

These are the procedures that have no impact on how a service or product is delivered to a customer. However, they assist the company in developing a setting where the core operations may operate more effectively. The term "supportive process" derives from this. These are the procedures that fall under the scope of accounting, human resources, and any other departments that assist in carrying out the core operations of the company.

Ex:- Recruiting new workers is a supporting process that aids in corporate growth.

### 1.1.4 Overall Business Process of Yard of Ale beverage company

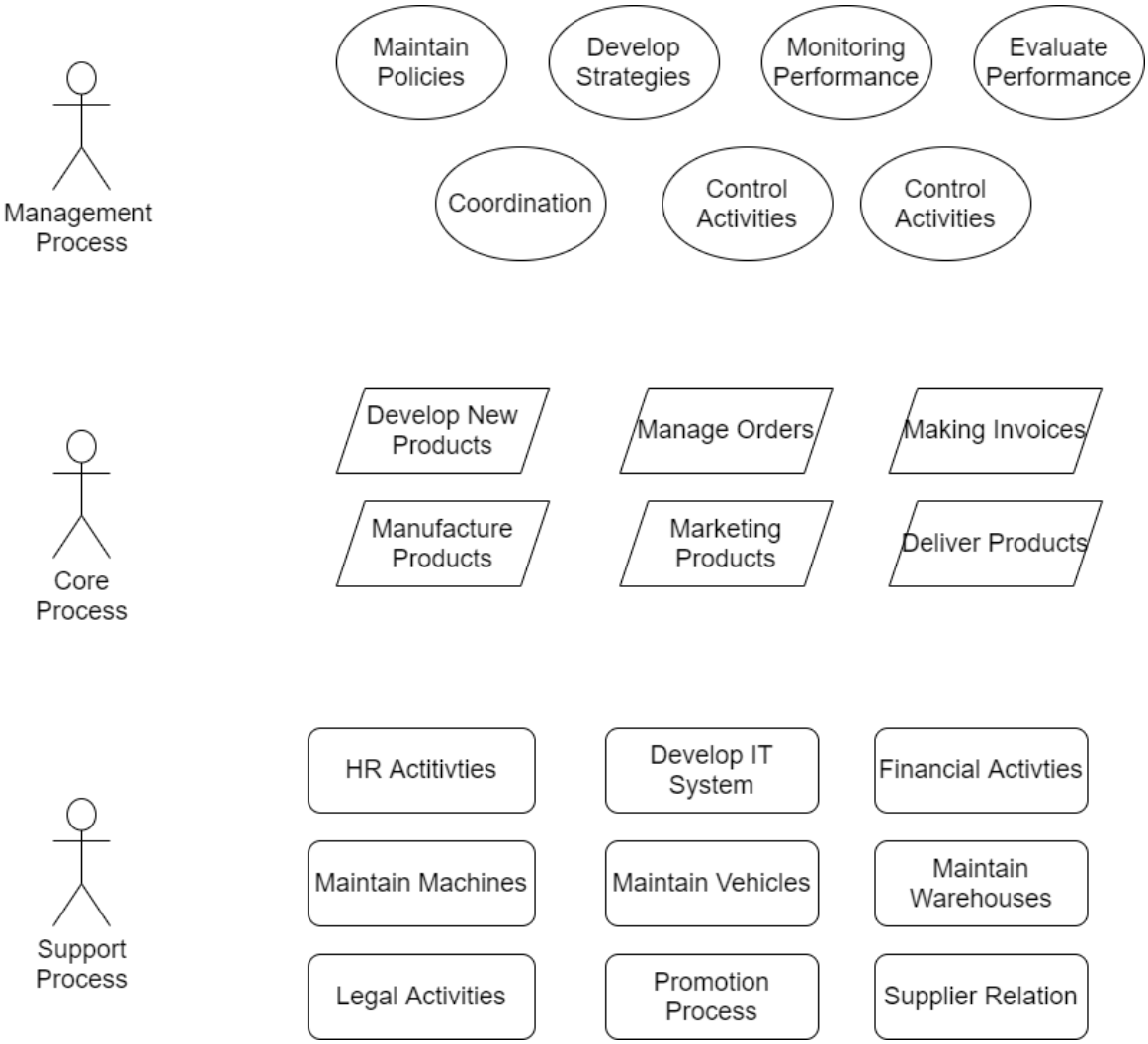



*Figure 1. 3 Overall Business Process of Yard of Ale beverage company*

**Management Process of Yard of Ale beverage company :**

Planning, coordination, monitoring, and control are requirements for all processes, whether they are core or support activities. Measurement of overall performance and handling of hazards and opportunities that might benefit or hurt the company is also included in management processes. Management is also responsible for making sure that financial goals and budgets are accomplished as well as requirements for regulatory compliance. Although management processes don't produce income directly, they optimise revenue generation and guarantee the ongoing existence of the company as a whole.

**Core Process of Yard of Ale beverage company :**

The core process is the company's main source of income. Each task that directly contributes to the creation of the outputs that the company provides to its clients is a component of a core process. We require inputs in order to produce outputs, and we use a process to go from inputs to outputs. Each main process has a number of subsidiary processes, as shown in the above diagram. All of them directly contribute to the products or services that our customers receive, whether they provide value or not. These procedures are frequently referred to as the value chain because they form the foundation of the company's value.

**Support Process of Yard of Ale beverage company :**

On the surface, there might be a slight difference between creating value and making it possible for others to create value, yet there are vast differences between the two ideas. Core operations immediately benefit external clients and bring in money. Internal "clients" are served through support procedures, which do not provide income in and of themselves. As soon as we begin to consider processes along with functions, it becomes clear that some functional areas will be involved in both support and core operations. For instance, financial operations are a crucial component of customer service that are directly involved in the value chain and keep track of client accounts.

## 1.2 Support Process

### 1.2.1 Yard of Ale's beverage company Support Process

Support processes, also known as enabling processes, cover a variety of business functions that facilitate providing customers with products or services. Depending on the goods or services that are offered, an enterprise's support procedures may vary. These areas are regarded as support processes for the Yard of Ale's beverage company.

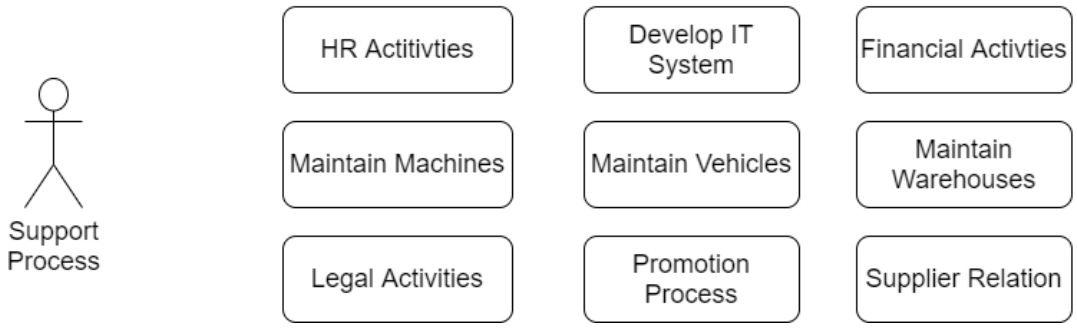



*Figure 1. 4 Yard of Ale's beverage company Support Process*

- HR Activities: Recruiting employees.
- Develop IT System: Maintaining software and systems that support production or control.
- Financial Activities: Keeping financial records and paying taxes.
- Maintain Machines: Maintaining machines that support production or control.
- Maintain Vehicles: Maintaining vehicles that support distribution or supply.
- Maintain Warehouses: Maintaining facilities that support production or storage.
- Legal Activities: Answering management requests and providing legal business support.
- Promotion Process: Assess employee productivity and skills.
- Supplier Relation: Finding supplies for production and dealing with suppliers on a daily basis.

### 1.2.2 Subsidiary Support Processes of Yard of Ale's beverage company

The support process flow for supply requests is shown in the following diagram.

This diagram shows a Vertical Support Process. The fundamental goal of a Vertical Support Business process is to deliver numerous functional services across a small number of business domains.

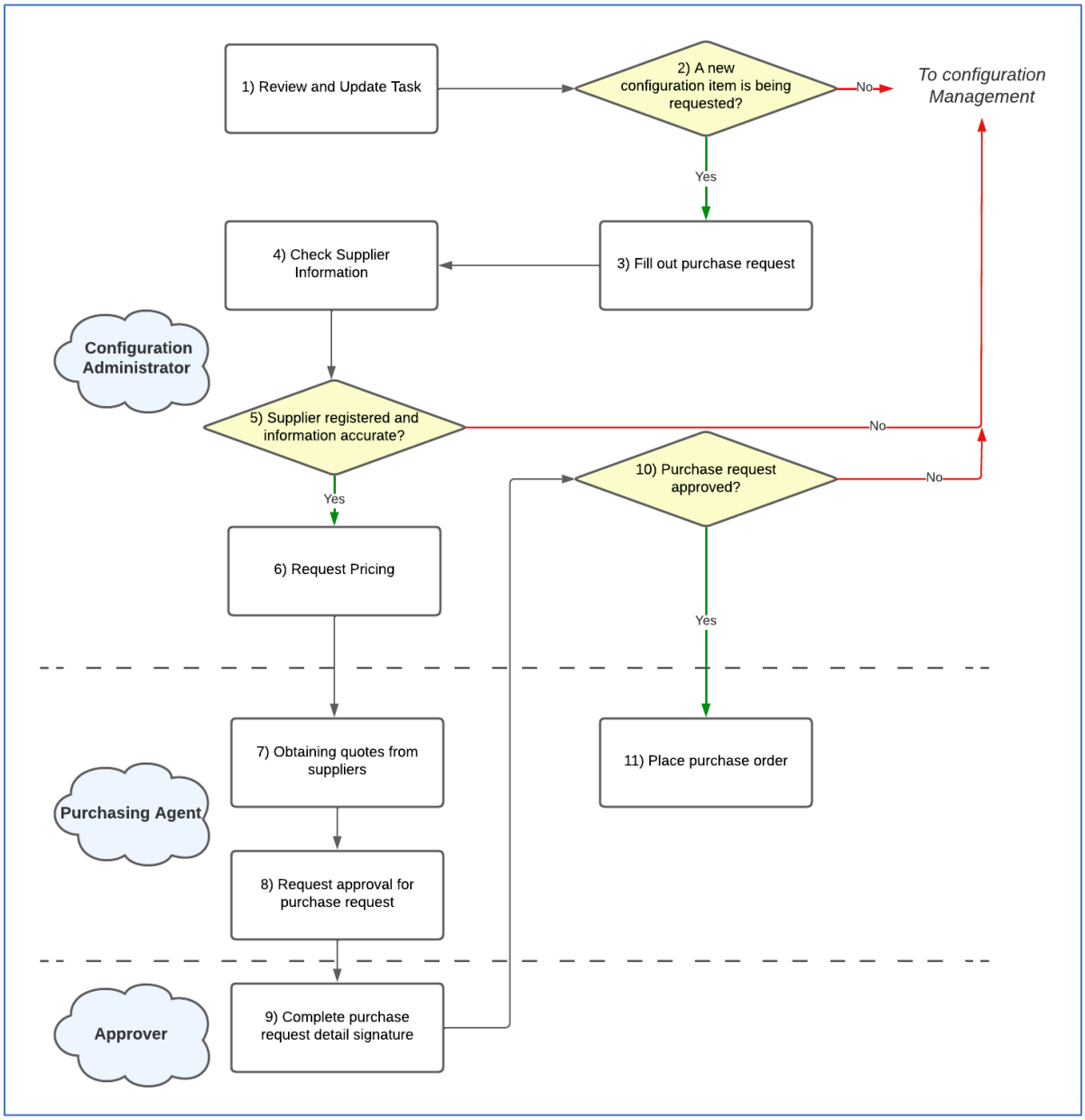



*Figure 1. 5 Vertical Support Process of Yard of Ale's beverage company*

The support process flow for HR Management is shown in the following diagram.

This diagram shows a Horizontal Support Process. The horizontal support process incorporates outsourcing that is focused on functions.

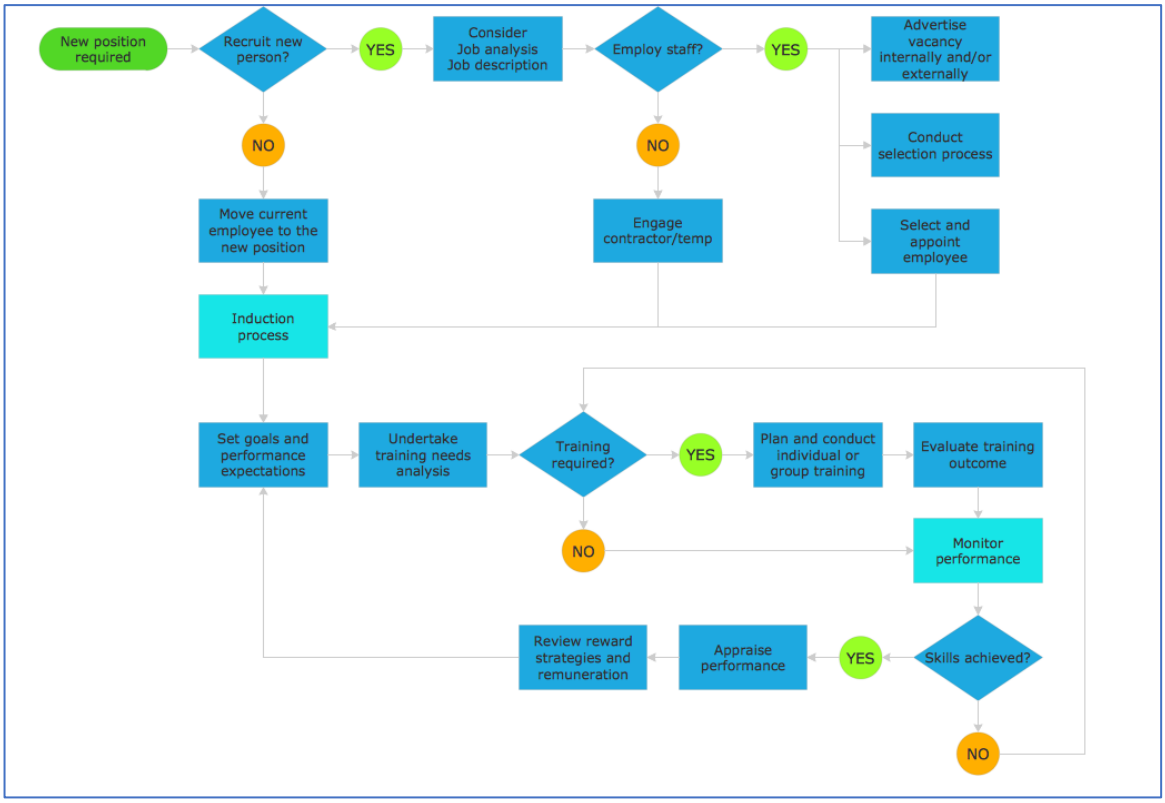



*Figure 1. 6 Horizontal Support Process of Yard of Ale's beverage company*

# Recognizing the differences between semi-structured and unstructured data inside an organization.

## 1.3 Unstructured Data

### 1.3.1 What is Unstructured Data

Unstructured data is described as information that is present in its rawest form. Due to its complicated organization and structure, these data are challenging to process. Unstructured data management can arrange data in a data store in a logical, predefined way using information from a variety of sources, such as social network postings, conversations, satellite imagery, IoT sensor data, emails, and presentations. Structured data, on the other hand, refers to data that adheres to predetermined data models and is simple to analyze. Examples of structured data are credit card numbers that are appropriately ordered and customer names that are alphabetized. Let's examine some examples after learning what unstructured data is.

Any information that is not in a specified format is considered unstructured data. This could be a section of a book with significant information in it or a webpage. Log files that are difficult to separate could also be considered an example of unstructured data. It's important to examine social media posts and comments. An example of unstructured data associated with Yard of Ale Beverage Company is given below:

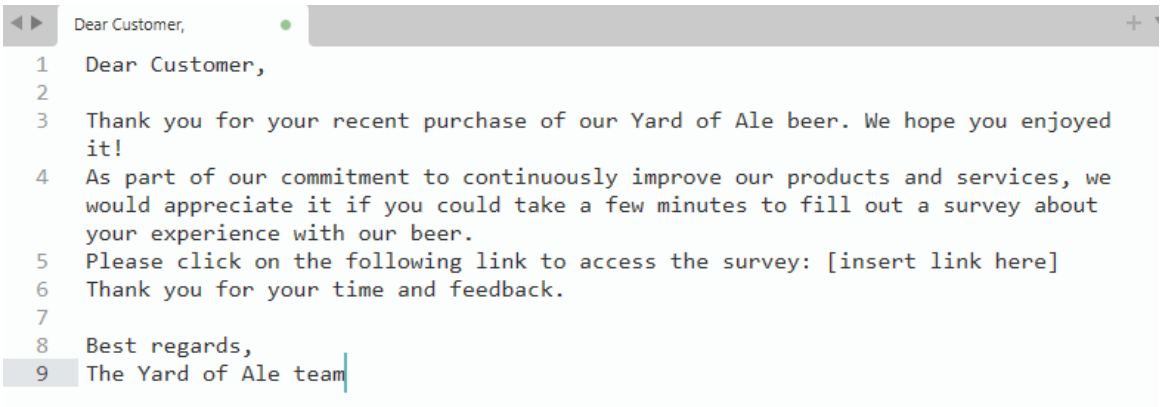



*Figure 1. 7 Structured Data example as an email.*

Above figure  is an example of an email with unstructured data in the form of text written in natural language. The text asks for feedback and mentions a recent purchase, however the information is not presented in a clear or consistent manner.

Unstructured data is primarily categorical and characterized because it is qualitative rather than quantitative. For instance, information from websites or social media can be utilized to forecast consumer trends or assess the success of marketing efforts. Another example of unstructured data analytics is spotting trends in scam emails and chats, which can help organizations monitor policy compliance. As a result, unstructured data is retrieved and stored for analysis in unstructured data warehouses (also known as data lakes).

Types of  Unstructured Data:-

- Surveys
- Images (JPEG, GIF, PNG, etc.)
- Videos
- Reports
- Memos
- Word documents and PowerPoint presentations
- Web Pages


*Figure 1. 8 Unstructured Data*

*Table 1. 1 Pros and Cons of Unstructured Data*

| **Pros and Cons of Unstructured Data** | |
|---|---|
| **Pros** | **Cons** |
| This supports information that is not properly formatted or ordered. | Due to a lack of schema and organization, unstructured data is challenging to store and maintain. |
| There is no fixed schema that restricts the data. | Due to the data's confusing structure and lack of pre-defined properties, indexing is challenging and error-prone. Search results are therefore not particularly accurate. |
| Due to the lack of a schema, very flexible. | Data security is a challenging issue. |
| The data is portable. | |
| This has great scalability. | |
| This can manage the diversity of sources with ease. | |
| There are several business intelligence and analytics applications for this type of data. | |

### 1.3.2 Information extraction techniques for unstructured data

Unstructured data lacks structure, making it difficult for traditional algorithms to understand it. Unstructured data is also challenging to tag and index. It is therefore difficult to obtain information from them. Here are a few possible solutions.

- Data classification or taxonomies assist in the hierarchical organization of data. which will simplify the search procedure.
- Data can be automatically categorized and kept in a virtual repository. Documentum, for instance.
- Employing software platforms such as XOLAP.
- Information can be extracted from emails and XML-based documents with the use of XOLAP.
- Using a variety of data mining methods

(ihritik, What is Unstructured Data, 2021)

## 1.4 Semi-Structured Data

### 1.4.1 What is Semi-Structured Data

Unstructured or structured data sets aren't always present in our data sets. Semi-structured data, also known as partially structured data, is a subset of structured and unstructured data. Semi-structured data is data with a number of consistent and recognizable qualities. It does not require a fixed structure like that required for relational databases. To make semi-structured data more manageable, organizational qualities such as metadata or semantic tags are used. It does, however, have some fluctuation and inconsistency.

Delimited files are an example of a semi-structured data format. It has elements that can divide the data into distinct hierarchies. Similarly, digital images do not have a pre-defined structure but do have certain structural qualities that make them semi-structured. For example, a smartphone image would have structured features such as geotagging, device ID, and Date and Time stamp. After being saved, photos can be given tags such as 'pet' or 'dog' to provide structure.

Types of  Unstructured Data:-

- JSON files
- HTML web pages
- CSV files
- XML and other markup languages
- Binary executables
- TCP/IP packets
- Zipped files

One type of semi-structured data is HTML, which uses tags to arrange text and other types of data. Here is an example of Json code used to represent semi-structured information about Yard of Ale Beverage Company.

```
{
   "product_name": "Yard of Ale Lager",
   "product_type": "Lager",
   "price": 3.99,
   "quantity": {
      "in_stock": 200,
      "sold": 50
   },
   "ingredients": [
      {
         "name": "Malt",
         "amount": "2 pounds"
      },
      {
         "name": "Hops",
         "amount": "1 ounce"
      },
      {
         "name": "Yeast",
         "amount": "1 packet"
      }
   ],
   "reviews": [
      {
         "username": "beerlover123",
         "rating": 4,
         "comment": "Great tasting beer, would definitely buy again!"
      },
      {
         "username": "aleconnoisseur",
         "rating": 5,
         "comment": "One of the best lagers I've ever had!"
      }
   ]
}
```

*Figure 1. 9 Semi-Structured Data example as a Json code*

The "Yard of Ale Lager" is a particular product of Yard of Ale Beverage Company, and this code represents semi-structured data about it. The information comprises semi-structured information like the list of components and customer reviews, which are presented in a nested format, as well as structured information like the product name, type, price, and quantity in stock.

*Table 1. 2 Pros and Cons of Semi-Structured Data*

| **Pros and Cons of Semi-Structured Data** | |
|---|---|
| **Pros** | **Cons** |
| There is no fixed schema limiting the data. | Data storage is challenging in the absence of a rigid, set format. |
| Data is flexible (Schema changes are simple to do.). | Since the schema and the data are intertwined, it is challenging to interpret the link between the data. |
| The data is portable. | In comparison to structured data, queries are less effective. |
| Structured data can be seen as semi-structured data. | |
| Users who are unable to explain their needs in SQL can still use it. | |
| It can manage the diversity of sources with ease. | |

### 1.4.2 Information extraction techniques for semi-structured data

Since the sources are diverse, semi-structured data have distinct structures. They occasionally have no structure at all. This makes indexing and tagging problematic. Therefore, getting information from them is a challenging task. Here are some possible solutions.

- Semi-structured data can be indexed using graph-based models, such as the OEM model.
- OEM's data modelling technique enables the storage of data in graph-based models. It is simpler to search and index the data in a graph-based architecture.
- Data can be organized hierarchically using XML, allowing for indexing and searchability.
- Using different data mining tools.

(ihritik, What is Structured data, 2021)

## 1.5 Structured Data

### 1.5.1 What is Structured Data

Data that has been arranged and formatted in a certain way to make it easily readable and comprehensible by both people and machines is referred to as structured data. This is often accomplished by using a well-defined data model or schema, which gives the data structure. Spreadsheets and databases frequently contain structured data, which is differentiated by its organization. Every record or row in the schema normally represents a unique instance of a certain data element, which is then given its own field or column. A client database might, for instance, have fields for the customer's name, address, phone number, and email address in each record.

The ease with which structured data can be accessed, queried, and analyzed using a variety of tools and methodologies makes it extremely valuable. This makes it the perfect format for applications involving machine learning and artificial intelligence as well as data-driven software like business intelligence and analytics.

Types of  Structured Data:-

- SQL Databases
- Spreadsheets such as Excel
- OLTP Systems
- Online forms
- Sensors such as GPS or RFID tags
- Network and Web server logs
- Medical devices

Here is an example of structured data associated with the Yard of Ale Beverage Company that is expressed in Python code using a dictionary:

```
beverages = {
    "beer": {
        "types": ["IPA", "stout", "pilsner", "lager"],
        "price": {"small": 5.99, "large": 7.99},
        "availability": {"small": 100, "large": 50}
    },
    "wine": {
        "types": ["red", "white", "rose"],
        "price": {"glass": 6.99, "bottle": 24.99},
        "availability": {"glass": 50, "bottle": 20}
    },
    "spirits": {
        "types": ["whiskey", "gin", "rum", "vodka"],
        "price": {"shot": 4.99, "cocktail": 8.99},
        "availability": {"shot": 200, "cocktail": 100}
    }
}
```

*Figure 1. 10 Structured Data example as a Python code*

In this example, the data is arranged into a nested dictionary, where the top-level keys stand in for the various beverage types that Yard of Ale offers, while the nested entries provide details on the various beverage variety, their prices, and their availability. This information could be utilized for a variety of structured analysis and reporting tasks, such as determining the most widely consumed beverage types, estimating beverage sales income, or monitoring stock levels.

*Table 1. 3 Pros and Cons of Structured Data*

| Pros and Cons of Structured Data | |
|---|---|
| **Pros** | **Cons** |
| Structured data's clearly defined structure makes it simple to store and access data. | Unstructured or semi-structured data can often provide additional context and information that structured data lacks, making it more challenging to comprehend the meaning and relevance of the data. |
| Data can be indexed based on properties and text strings. This simplifies the search process. | Relational databases and related technologies, which can be costly to develop and maintain, are necessary for the usage of structured data. |
| The process of extracting knowledge from data through data mining is simple. | While the data is structured, there may occasionally be gaps in the information or data that does not fit neatly into the specified schema, which can cause problems with data quality. |
| Actions like updating and deleting are simple since the data is well-structured. | |
| Operations involving business intelligence, such as data warehousing, are simple to carry out. | |
| Data security is simple to ensure. | |

(ihritik, What is Structured data, 2021)

## 1.6 Differences between Structured, Semi-structured and Unstructured data

*Table 1. 4 Differences between Structured, Semi-structured and Unstructured data*

| Properties | Unstructured data | Semi-structured data | Structured data |
|---|---|---|---|
| **Technology** | Based on binary and character data. | Based on XML/RDF(Resource Description Framework). | Based on relational database table |
| **Transaction management** | Absence of concurrency and transaction management. | Transactions are adapted from immature DBMSs. | Matured transaction can see. And also various concurrency. |
| **Version management** | Versioned all at once | It is possible to version across a graph or tuples. | Versions over tuples, rows and tables. |
| **Flexibility** | There is no schema, therefore it is more adaptable. | Compared to unstructured data, it is less flexible but more flexible than structured data. | Schema is depend on rigorous schema. |
| **Scalability** | This is much more scalable. | Scaling is less complicated than with structured data. | Difficult to scale Database |
| **Robustness** | | Recent technology is not widely used. | Very robust |
| **Query performance** | There is just support for textual queries. | There is the option to query across anonymous nodes. | Structured query allowing complex joins. |

(Vishwakarma, 2021)

# Evaluating the advantages and disadvantages of utilizing application software as a business processing mechanism

Software can be divided into 2 categories.

1) System Software and
2) Application Software

## 1.7 System Software

### 1.7.1 Introduction to System Software

Computer programs known as "system software" are created to handle a computer's hardware and application software. The system software serves as the link between the computer system's hardware and user applications if we consider a layered architecture of a computer system. The most well-known example of system software is the Operating System.

All further computer programs are controlled by the Operating System. The computer itself is operated by system software. In order for users to execute higher-level application software to carry out specific activities, it runs in the background, supporting the computer's fundamental functions. Application software can be run on top of the infrastructure provided by system software.

## 1.7.2 Types of System Software

The following categories apply to systems software.

**Operating system:-**

The operating system software of a computer system assists in the efficient use of all of its hardware and software components. This is a specific class of system software kernel that stands in the way of the user and computer hardware. In order for devices and programs to be recognized and work properly, it must first be installed on a computer.

Examples:

- Widely used PC operating systems:- Windows 10, Mac OS, Ubuntu
- Widely used network or server systems:- Ubuntu Server, Windows Server, Red Hat Enterprise
- Widely used web OS systems:- Chrome OS, Club Linux, Remix OS
- Widely used mobile OS systems:- iPhone OS, Android OS, Windows Phone OS

**Device Drivers:-**

Driver software, a subset of system software, is what powers peripherals and computer hardware. All connected devices and add-ons can now function as planned and in accordance with the OS due to drivers. The operating system would not allocate any tasks if there were no drivers. For the majority of devices already on the market, the operating system often comes with drivers. The drivers for input devices like the mouse and keyboard are installed by default. They might never need installations from third parties.

Examples:

- Mouse, Keyboard, Soundcard, Display card, Network card, Printer

**Firmware:-**

To be recognized by the OS, a flash, ROM, or EPROM memory chip must have firmware stored within it. All operations of each piece of hardware are directly managed and controlled by it. Firmware was once used to refer to fixed software, as indicated by the word firm. It was preprogrammed on non-volatile chips, which could only be upgraded by replacing them with fresh, unprogrammed chips. This was done in order to set them apart from higher-level software that could be upgraded without switching out components. Flash chips are used nowadays to store firmware and allow for upgrades without changing semiconductors.

**Programming language translators:-**

Software developers use these intermediary programs to convert source code written in high-level languages into code written in machine language. Programming languages that are simple for people to understand and use make up the former. The latter is a difficult code that the processor alone can decipher. Compilers, assemblers, and interpreters are examples of common translation languages. Usually, computer manufacturers are the ones who create them. It is possible for translator programs to translate all of the program codes at once or just specific instructions.

**Utilities:-**

System software types known as utilities fall in the category between system and application software. These programs are designed to perform computer diagnostic and maintenance duties. They are useful in making sure the computer runs smoothly. They perform a variety of duties, from disk drive defragmentation to vital data security. The majority are third-party tools, however, some may be included with the operating system. In addition to being offered separately, third-party tools can also be purchased in packages with other software, such as Hiren Boot CD, Ultimate Boot CD, and Kaspersky Rescue Disk.

## 1.8 Application Software

### 1.8.1 Introduction to Application Software

A type of software known as application software, or App, allows the end user to engage with it directly and have it carrying out certain tasks for them. The only goal of application software is to assist the user in carrying out specific tasks. Microsoft Word and Excel are examples of application software that is used on a personal computer or laptop, as well as web browsers like Firefox and Google Chrome.

It also includes games like Candy Crush Saga and Ludo, as well as mobile applications like WhatsApp and Telegram. There are applications that connect customers with their businesses as well as popular services that people use every day, including weather or transportation information.

### 1.8.2 Types of Application Software

- Word Processing Software: MS Word, WordPad and Notepad
- Database software: Oracle, MS Access and Microsoft SQL
- Spreadsheet software: Apple Numbers and Microsoft Excel
- Multimedia software: Real Player, Media Player and VLC Player
- Presentation Software: Microsoft PowerPoint and Keynotes
- Enterprise Software: Customer relationship management system
- Educational Software: Encarta, MATLAB, Google Earth, NASA World Wind
- Simulation Software: Flight and scientific simulators
- Content Access Software: Accessing content through media players, web browsers
- Application Suites: OpenOffice and Microsoft Office
- Software for Engineering and Product Development: IED such as visual basic

### 1.8.3 Comparison between System Software and Application software

*Table 1. 5 Comparison between System Software and Application software*

| System Software | Application Software |
|---|---|
| These are mostly used to manage the system's resources, such as memory and process management. | These are primarily designed to fulfill the user's expectations for carrying out particular tasks. |
| Application software serves for a general purpose. | Application software serves a specific purpose. |
| A machine language or assembly language was used to write this. | Application software is created using a high-level language. |
| When the system is turned on, the system software begins to execute and continues until the system is turned off. | The user initiates the start of the application software, and the user ends the application software. |
| Capable of functioning independently. | Can't be operated independently. |
| Since system software runs in the background, users never interact with it. | While utilizing specific applications, users engage with the application software. |
| The system software is independent of the application software. | System software is required to run application software. |
| The proper operation of a system depends on the system's software. | The system's ability to function is not critically dependent on application software. |

## 1.9 Business Application Software

### 1.9.1 Introduction to Business Application Software

Businesses utilize business application software since it facilitates decision-making, enhances stakeholder collaboration, and promotes overall corporate health. In other words, a software program or a group of programs that offer business capabilities are known as business applications. Additionally, they are employed to boost and keep track of productivity across the entire company. Applications for businesses can be used internally, externally, or in conjunction with other apps for businesses. We can either have them custom-built or buy them off the market. The particular requirements and financial constraints of a business will determine the type of software they select.

Software for business applications handles client and business data. Due to the cybersecurity concerns brought on by cybercriminals and other malicious attackers, some users might be extremely nervous. As a result, software engineers put a lot of effort into ensuring the safety of the systems and programs they create. They achieve this by implementing security features including user login notifications, user access levels, and data encryption.

Since some worry that the software may eliminate their jobs, some users are hesitant to integrate it into their business processes. But putting these programs in place won't make them useless. As a result, they will be working on higher-level deliverables, which will move them up the hierarchy. Additionally, it enables them to concentrate on harder activities and make the most of their time.

## 1.10 Business Application Software used in the Yard of Ale's beverage company with benefits and drawbacks

### 1.10.1 Business application Software to track Inventory and Production

For complicated inventory management requirements, Excel spreadsheets and pen and paper are insufficient. Companies waste too much time looking for the information they need with a manual inventory system. Aside from that, businesses would also have to deal with data corrections and lost items.

An inventory management system is what Yard Ale's Beverage Company needs. By structuring and continuously updating the company's inventory data and supply chain information, this system should be able to assist the Yard Ale's Beverage company save time and money.

The top inventory management program available is called **Fishbowl**, and it has a wide range of features that are advantageous to manufacturers and warehouse operators. The Yard Ale's Beverage Company can effectively manage many products and warehouses by tracking each inventory item with serial numbers, expiration dates, and other information. Additionally, this facilitates the organization of difficult manufacturing jobs with multiple manufacturing orders, bills of ingredients, and production stages. Additionally, this application has a ton of other features for tracking inventory and production.

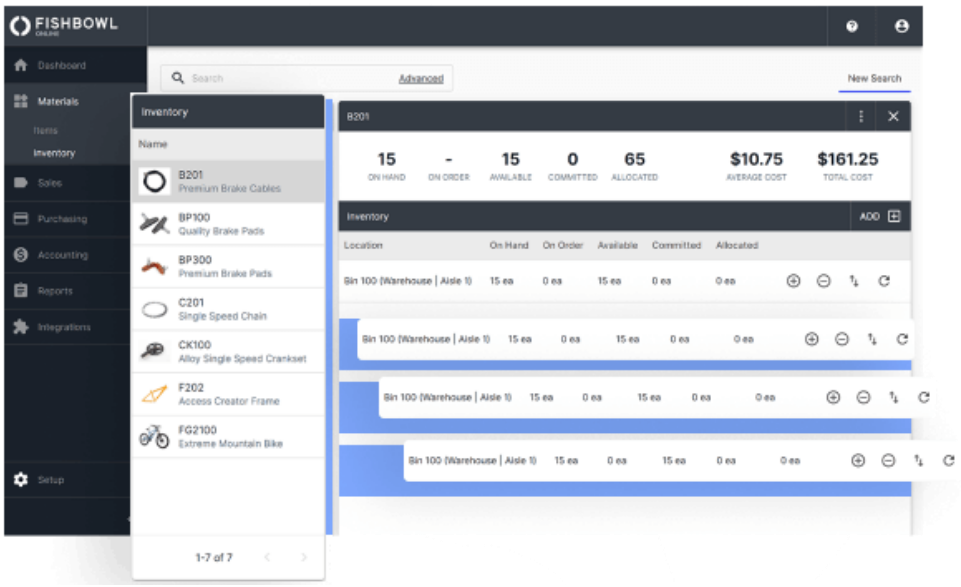



*Figure 1. 11 Fishbowl application dashboard*

**Advantages →**

- When an item is in stock, this instantly notifies both employees and customers. The inventory and sales are in sync, thus a running count of what is and isn't in stock is available.
- To track cash flow, this platform can be integrated with accounting software.
- This program can do more than just keep track of where the inventory is and when it has to be reordered. In order to produce the necessary forecasting and strategic planning reports, this data collecting is undertaken.

**Disadvantages →**

- The possibility of a system crash is one of the main issues with any of these systems. Data loss can be caused by a corrupt hard disk, power failures, and other technological problems.
- Hackers search for any opportunity to obtain customer or business information. This system's connection to point-of-sale equipment and accounting makes it an attractive target for hackers looking for possible financial data or the private information of business owners, suppliers, or customers.
- It is simple to skip time-consuming physical inventory audits when everything is automated. When the computers are doing the work, they could no longer seem required. But it's crucial to keep conducting routine audits to spot losses like spoilage or breakage. Additionally, audits assist business owners in spotting possible internal theft and sabotage with the computerized inventory system.

**Conclusion →**

Yard Ale's Beverage Company's core business processes can thus be handled using this Fishbowl Business Application. The diagram below illustrates the company's core business processes.

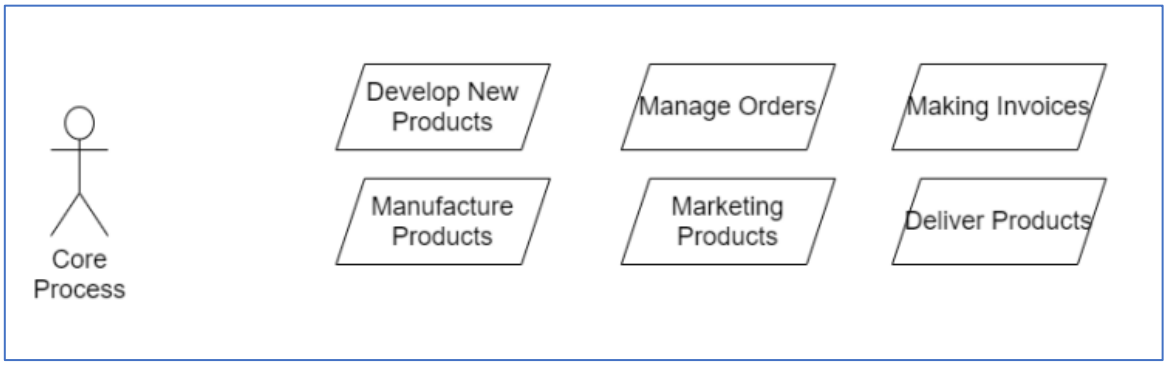



*Figure 1. 12 Yard Ale's Beverage Company Core Business Processes*

So, using this application, newly developed products can be added to the inventory and the manufacturing process may be tracked. It is also possible to manage orders, create invoices, and track delivered products with this application. **Hence, this Business Software is mainly used by Yard Ale's company to handle the products.**

### 1.10.2 Business application Software to Enterprise Resource Planning (ERP)

A sort of software system called enterprise resource planning (ERP) assists firms in managing and automating key business activities for optimum performance. A company's business activities are coordinated by ERP software, creating a single source of truth and expediting operations throughout the whole organization. The financials, supply chain, operations, business, reporting, manufacturing, and human resources functions of an organization can all be integrated into one platform.

Yard Ale's Beverage Company need an ERP system in order to assist remove barriers between the front office and back office and to provide the flexibility to adapt solutions to changing business goals, Yard Ale's Beverage Company can use ERP systems which can cover many Core Business functions.

The top Enterprise Resource Planning program available is called **SAP ERP**, and it has a wide range of features that are advantageous to address a wide range of core functions

within the business. This ERP system can provide a full, multichannel commerce solution that integrates back-office, in-store, and digital experiences for the numerous difficulties that face today's businesses. Through AI (Artificial Intelligence) recommendations, retailers enable customers to have a more personalized and smooth customer experience while boosting employee efficiency, lowering corruption, and expanding businesses.

Profitability is increased while compliance is pushed by this SAP ERP. Yard Ale's Beverage Company may access real-time information whenever and wherever they choose with the help of the dashboards and AI-driven insights that provide an overview of current money. By using robotic process automation to automate routine tasks, this ERP feature enhances company communication and gives manufacturers the capacity to meet demand while managing resources thanks to real-time data access. Project management, cost management, and production planning are also optimized with this ERP software.

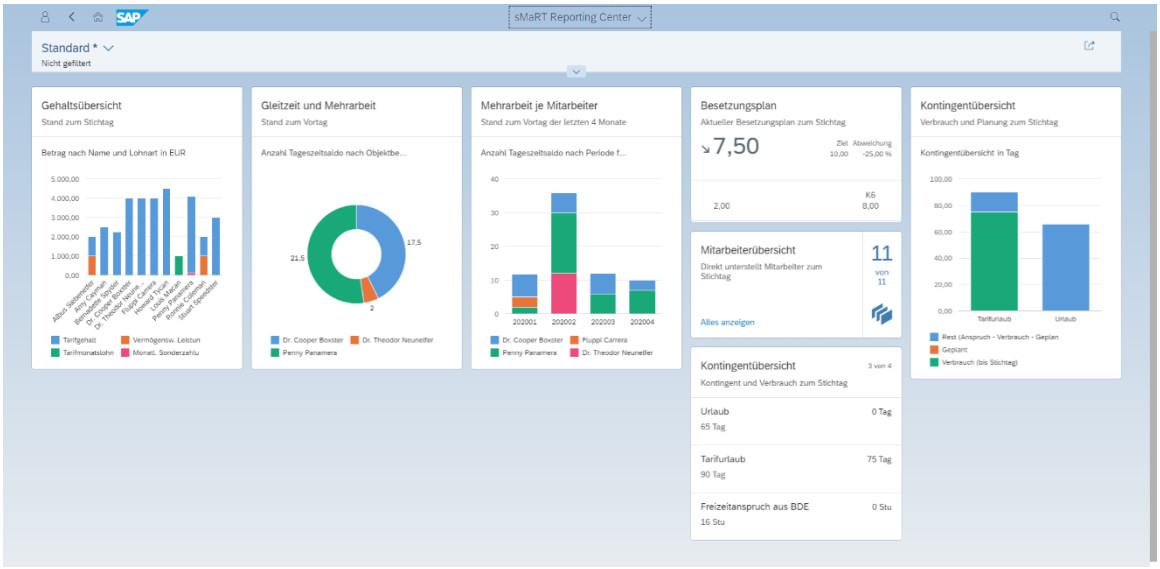



*Figure 1. 13 SAP ERP application dashboard*

**Advantages →**

- One of the most important benefits of this ERP software is that it may help the organization save money in a variety of ways.

- This ERP system minimizes errors and the need to hire more staff at the same rate as business growth by automating repetitive processes and streamlining everyday procedures.
- With the help of this ERP, projects may stay on schedule and avoid bottlenecks and delays brought on by incomplete or unavailable information.
- With the use of enterprise resource planning software, senior management can all easily access data from any department and have complete control over all crucial business operations.

**Disadvantages →**

- It takes a lot of time, effort, and money to build an ERP solution.
- Implementing and maintaining platforms also necessitates additional spending and, occasionally, employing more technical personnel.
- Because ERP systems offer such a wide range of features and capabilities, they are also incredibly complex, which some users find challenging to manage.
- Users will need to enter current data into a new format while using an ERP system for the first time. The data migration procedure can take a long time to complete, especially if done manually, especially for a large business-like Tard Ale.

**Conclusion →**

Yard Ale's Beverage Company's core business processes can thus be handled using this SAP ERP Business Application. This business can handle routine company operations with the use of this ERP. And by serving as a central repository for data, this ERP software helps this business plan, budget, forecast, and report on financial results. **Hence, this Business Software is mainly used by Yard Ale's company to handle daily operations and financial forecasting.**

### 1.10.3 Business application Software to Customer Relationship Management

A software program called CRM, which stands for "Customer Relationship Management," makes it simple for business owners to keep track of all correspondence and develop relationships with their prospects and customers. The several spreadsheets, databases, and apps that many businesses put together to maintain customer information are replaced by a CRM.

Yard Ale Beverage Company may integrate all of the data from their customers and sales leads in one location by using client management tools like CRM. This CRM combines all interactions with leads and clients, including form fills, phone calls, chats, text messages, and meetings, as well as paperwork, quotes, purchases, and tasks. In order to close a transaction or provide exceptional service, the entire team of the organization can access those facts with CRM software at the appropriate time.

The top Customer Relationship Management program available is called **NetSuite CRM**, and it has a wide range of features that are advantageous to address a wide range of core functions within the business. This Yard Ale Beverage Company uses NetSuite's CRM solution to handle relationships with partners, suppliers, partners, and current and new customers in an one location. A smooth information flow is provided by NetSuite CRM throughout the whole customer lifecycle, from lead through opportunity, transaction, delivery, renewal, upsell, cross-sell, and service.

This software allows sales, marketing, and support teams to provide consistent and appropriate experiences across all touchpoints by providing a comprehensive picture of customer preferences, transactions, and interactions. When NetSuite CRM and commerce systems are natively integrated, this can improve the shopping experience. Sales get immediate access to prospects, clients, and order records due to the so-called NetSuite CRM.

Everyone who deals with consumers, sales, support, and service may get updated, real-time data through this system. The ability to provide a consistent service experience across interactions is made possible by NetSuite's 360-degree customer perspective, which gives service and support representatives more insight into client problems.

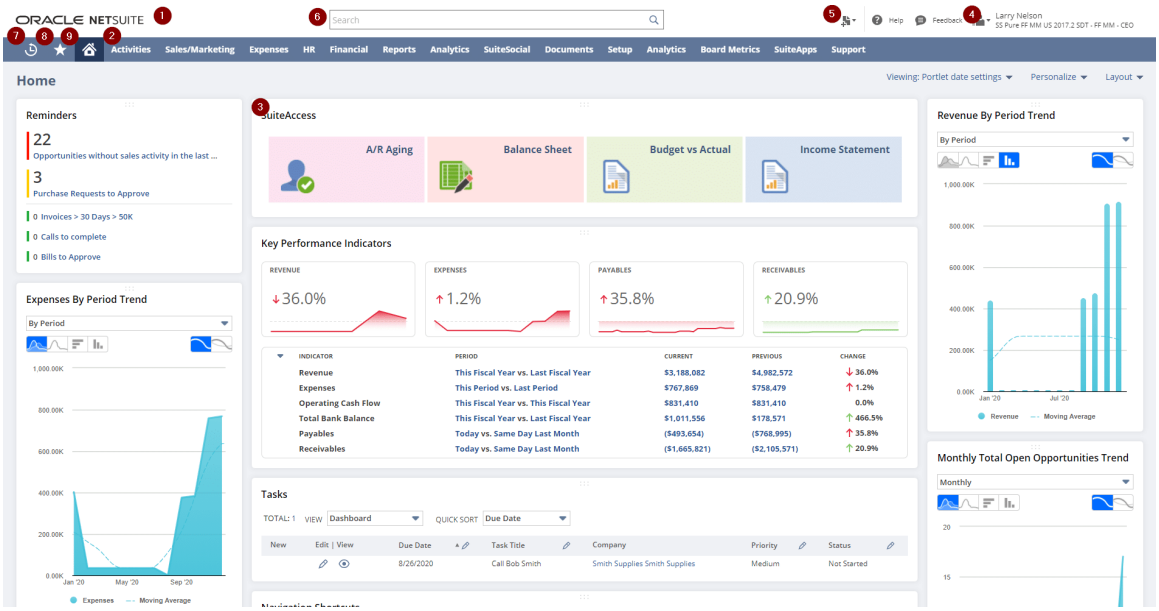



*Figure 1. 14 NetSuite CRM application dashboard*

**Advantages →**

Businesses can obtain all the necessary consumer information with the help of this application. Then, this data is saved and used to analyze consumer behavior.

The goal of this CRM software is to help organizations gain a growing number of clients. This aims to expand the consumer base and retain them around for a long time.

One of the main benefits of CRM to businesses is its affordability. This program assists in lowering costs in a variety of ways for various procedures. First of all, it lessens the amount of documentation needed for various tasks.

**Disadvantages →**

- The expense of implementing this CRM system for a business is enormous. CRM software is too expensive because there are several price packages available depending on the needs of the business.
- CRM needs skilled and qualified personnel to operate properly. The expense and effort required to train staff members on this CRM systems is considerable.

- The security of data that is gathered and stored is another significant disadvantage of CRM. The entire collection of data is kept in one central location, where there is a risk of loss or hacking.
- CRM operates on a totally automated basis, doing away with human participation. Customers might shift to another location if there is a loss of human contact, which would lower sales and revenue.

**Conclusion →**

Yard Ale's Beverage Company's core business processes can thus be handled using this Microsoft Dynamic 365 ERP Business Application. This business can handle routine company operations with the use of this ERP. And by serving as a central repository for data, this ERP software helps this business plan, budget, forecast, and report on financial results. **Hence, this Business Software is mainly used by Yard Ale's company to handle sales operations and to improve customer relationships.**

### 1.10.4 Business application Software to Resource Management

The majority of modern company activities need a variety of resources to be completed. The human resources are among those resources, and they may be the most important. Most company companies rely on their staff to engage with clients, complete specialized activities, and participate in strategic decisions. Employees are unfortunately limited resources, much as people's time and skills. Additionally, each person is limited to working on a single task, being in a single location, and using their expertise to advance a single project at any one time. The availability of other finite resources, such as machinery, space, and money, is also limited.

The top Customer Relationship Management program available is called **Monday.com**, and it has a wide range of features that are advantageous to address a wide range of Resource Management functions within the business. Monday.com resource management software can help Yard Ale Beverage Company handle the difficulties listed above by allowing them to organize, track, and improve how resources are used. This resource management software facilitates resource management by streamlining numerous associated activities.

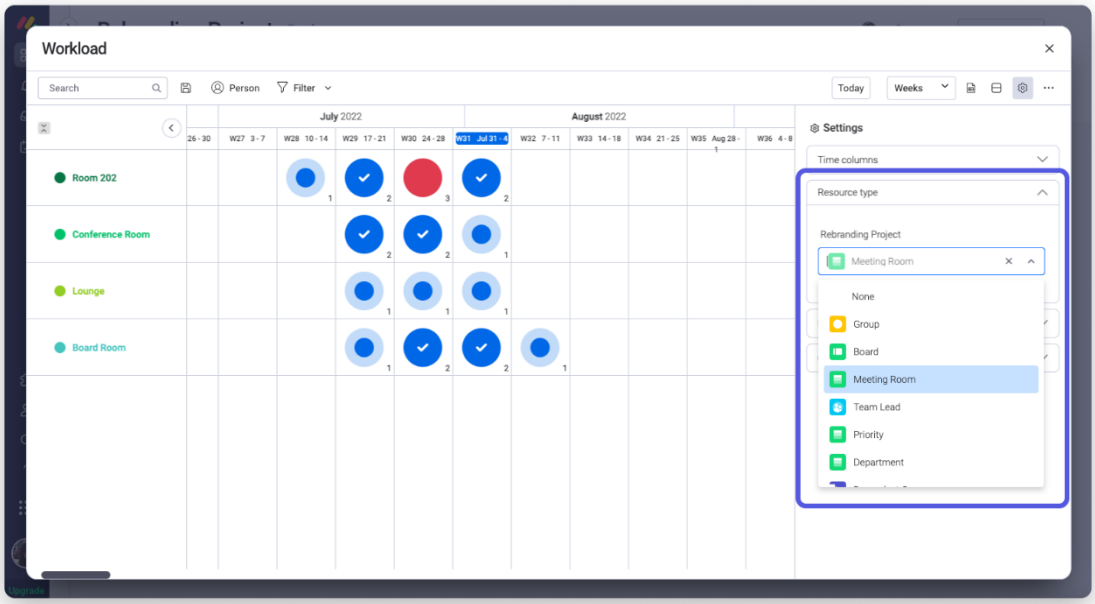



*Figure 1. 15 Monday.com resource management application dashboard*

**Advantages →**

- Unexpected problems can be avoided by using this software. By being aware of resources beforehand and planning how to use them, this can fix gaps or concerns before they develop.
- Gaining knowledge of the workload of the team through effective resource management enables minimizing overallocation or dependence on resources.
- A safety net may be provided by this program. A shortage of resources could lead the activities to fail. Planning and resource management shows that the most effective use of the resources was made.
- With the use of this application, managers can analyze a team's capacity and adjust their plans if they discover that the team is either completely booked or open to accepting new tasks.

**Disadvantages →**

- Personnel systems often adhere to plans and regulations to standardize how a corporation manages its people. A method that works for one person might not work for another since people are neither machines nor bits of data. Therefore, this application might not be very adaptable.
- The cost of human resource management systems is high. Although a company may need to invest in employee management, it may be preferable to spend that money on brand-new products or machinery.
- Employee orientation and training take time away from company responsibilities that produce immediate revenue. If the organization is understaffed or has to address urgent business challenges, a human resources program could divert employees when they are most needed.
- It is not assured that personnel who have received training will stay on employment. Investing in human resources programs could be risky since employers risk spending money on fostering the abilities of workers who leave the organization before they can recoup their investment.

**Conclusion →**

The purpose of this Monday.com application is to use resources as efficiently as possible. Transparency and easy collaboration are encouraged by this business application. Everyone is aware of their responsibilities and the timeframe in which they must complete them. The company management will have a clear overview of and control over the projects through the planning and administration of the organization's assets. Additionally, it will aid in goal-setting and better project planning for upcoming Yard Ale Beverage Company activities. **Hence, this Business Software is mainly used by Yard Ale's company to handle their resources and to get a better insight into the resources.**

## 1.10.5 Business application Software to Accounting Software

**QuickBooks** is a well-known accounting program for small and medium-sized enterprises. It enables users to handle their financial operations, including producing financial statements and creating invoices, tracking sales and costs, and handling payroll. Anyone without an accounting experience can utilize the software because it is simple to use and browse.

A number of features are available with QuickBooks, including editable templates for bill-paying, invoicing, and financial reporting. Moreover, users can handle purchase orders, create sales orders, and keep track of inventories. It is simple to interact with team members and clients because to the software's ability to link with other programs and be accessed from any location with an internet connection. In conclusion, QuickBooks CRM provides a full range of solutions to assist businesses in managing their client interactions and streamlining their sales procedures. It is an accessible and reasonably priced choice for small and medium-sized organizations wishing to automate their CRM and accounting procedures.

In addition, QuickBooks provides a number of interfaces and add-ons, including tools for project management, time tracking, and payment processing. This enables users to modify their software and adapt it to their particular business requirements. QuickBooks offers

access to financial and tax consultants in addition to its accounting tools, as well as training materials to aid users in understanding accounting fundamentals and best practices.

Overall, QuickBooks is an effective tool for companies seeking to automate their accounting procedures, understand their financial performance, and reach business decisions.

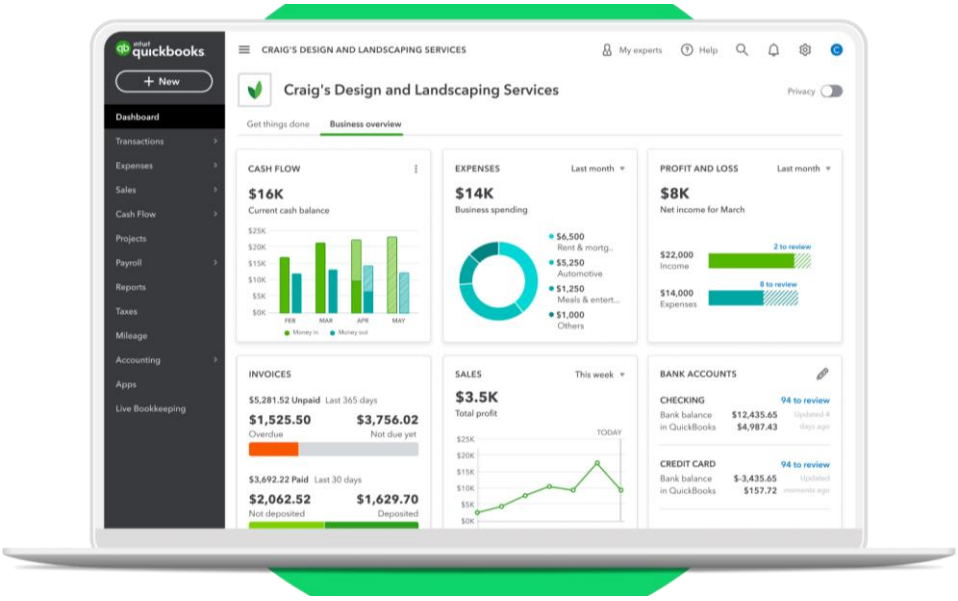



*Figure 1. 16 Quickbooks Customer Relationship Management application dashboard*

**Advantages →**

- Installing QuickBooks Online is not necessary. This online platform is particularly accessible because it can be viewed through a browser on any device. For use, QuickBooks Desktop must be installed on a specific device.
- There are various price plans available with Quickbooks Online. Up to 25 users may use the top version. There is only one plan for QuickBooks Desktop, and each extra user who is permitted access to the plan will cost money.
- The user interface of QuickBooks Online is really simple to use. The application is a cutting-edge and well-designed one that makes it simple for the user to locate what they need and utilize all the required functions without the need for training.
- Using a variety of options, QuickBooks Online lets users personalize their reports. With the features, users may select how they want to manage the financial data for their business and quickly obtain the data users require.

**Disadvantages →**

- QuickBooks Online cannot restore transactions from earlier versions of the books. This implies that users are unable to restore an unintentionally deleted item or return to a modified item. Users have to manually enter the data.
- There are several accounting tools available in QuickBooks Online's free version. Users will need to pay more money, though, to get access to add-ons, 25 users, and further features. The top plan costs six times as much as the entry-level plan. It makes sense to carefully consider the features that are necessary for the company in order to estimate the cost. Although fantastic, customization has a cost.
- A method for accepting payments via bank transfers, credit cards, and debit cards is available in QuickBooks Online. The charging setup is a drawback. For instance, there is a transaction fee of 2.4% for invoiced payment cards and 3.4% for swiped payment cards. These fees are more expensive than those that other contemporary payment processors typically demand.

**Conclusion →**

In conclusion, QuickBooks is an effective accounting program that can help companies of all sizes in effectively managing their money. Businesses can save time and enhance their financial decision-making processes by utilizing its capabilities, which include automated bookkeeping, invoice production, payment tracking, and financial reporting.

The Yard of Ale Beverage Company can make informed decisions about their business and finances by using QuickBooks to keep track of their sales, spending, and inventory in real-time. The company may concentrate more on expanding its business and satisfying client needs by reducing its accounting procedures.

**Hence, this Business Software is mainly used by Yard Ale's company to handle their accounts and to get a better insight about company revenue details and other financial records..**

# Comparing the various types of support available for business decision-making at different levels within an organization

## 2.1Types of Decision of the Management Levels

### 2.1.1 Introduction

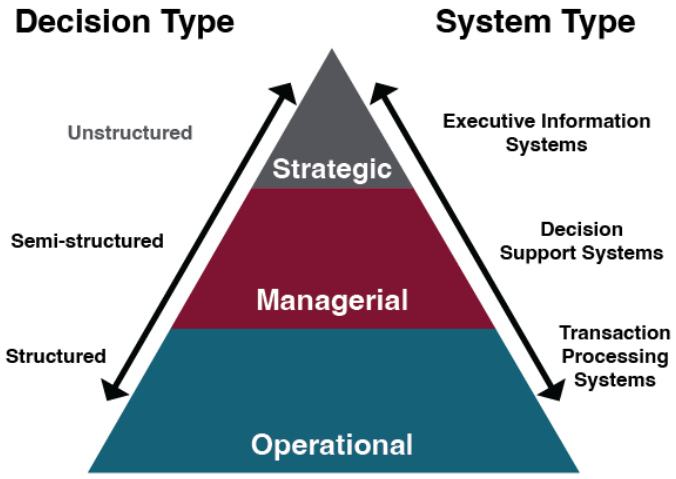



*Figure 2. 1 Types of Decision of the Management Levels*

There are many different types of decisions that an organization must make, from those that are highly structured to those that are not. An often made decision that is directly based on the inputs is referred to as a structured decision. When it comes to structured decisions, once we have the relevant data, we also know what needs to be decided. An example of a structured decision is inventory reorder levels. There is a requirement to order more widgets once your stock falls below a particular level. Such structured decision-based processes are excellent candidates for automation. They may also be known as predetermined choices.

An unstructured decision, on the other hand, involves a large number of unknown factors. They frequently depend on poorly defined criteria, and the available data is frequently ambiguous or inadequate. To come up with a smart answer, the decision-maker may need to use thoughtful judgment and innovative thinking. By giving the decision-makers the

means to collaborate and acquire knowledge, an information system can assist these kinds of decisions. The handling of a labor issue or the creation of policies for the use of new technology are two examples of unstructured decisions.

When making a semi-structured decision, the majority of the relevant factors are known, but the decision may still be influenced by personal experience and other external influences. The hiring process is an excellent illustration of a semi-structured decision. The decision is based on human experience in part and is structured in part (based on a person's experience, knowledge, etc.). Look at the algorithms that businesses are using to try to program this decision. Unstructured and semi-structured decisions are more difficult to make, and systems may not be fully equipped to assist. However, developments in artificial intelligence are assisting in changing this.

### 2.1.2 Operational Decisions

Strategic and tactical goals and objectives are connected through the process of operational planning. It outlines key dates, requirements for success, and how exactly a strategic plan will be implemented throughout a specific operational time.

An operational plan responds to four inquiries as below:

- “Now, where are we?”
- “What do we want to obtain?”
- “How will we get there?”
- “How do we track our progress?”

A company's products and services are the main focus of operational decisions, which also creates strategies to increase market share and create financial projections. Operational decisions concentrate on a company's operations, inventory, equipment, and labor force. The profitability of a company is examined using the financial ratios in an operational plan. For instance, the strategy could incorporate a contribution ratio study to

determine which activities are required to boost earnings. This can involve putting more of an emphasis on selling its premium products or bringing down variable costs.

### 2.1.3 Tactical Decisions

The focus of tactical planning, which is short-term planning, is on the many divisions of the organization's current operations. The term "short range" often refers to a time frame that is one year or less in the future. In order for the company to succeed one year from now or sooner, managers utilize tactical planning to lay out what the various elements of the organization must do. The sectors of production, marketing, personnel, finance, and plant facilities are often where tactical strategies are established.

Mistakes could happen during the implementation of a tactical plan due to the time frame and the type of questions presented. In contrast to strategic plans, tactical ones should be covered by minor uncertainties and may be more within management's control, such as energy usage or shipping costs for the following year, if there are no catastrophic blackouts. These errors are referred to as "tactical risks" together with their potential consequences.

As a continuation of strategic planning, tactical plans are developed for every level of an organization. It identifies the precise actions required to carry out a company's strategic plan. Tactical plans are often short-term in nature, describing what a corporation has to do, the order in which those tasks must be completed, and the personnel and tools required to satisfy the organization's strategic goals. Many departments within a company may contribute to the tactical plan. Businesses should review its tactical plan frequently to ensure that it is adhering to the defined procedures once it has been completed and put into action.

### 2.1.4 Strategic Decisions

The process by which an organization determines its strategy, or direction, and decides how to allocate its resources to follow this strategy is known as strategic planning.

Strategic planning often addresses at least one of the following three important topics for the entire company as opposed to simply a single unit:

- “What should we do?”
- "Whom are we doing it for?"
- "How can we succeed?"

For instance, a purchase is motivated by the answers to the first and third questions. Therefore, purchases are strategic decisions. Typically, strategic decisions are made with 3 to 5 years in mind, while some go as far as 20 years (long term).

Mistakes that could happen during the execution of a strategic plan are afflicted by large uncertainty because of the time horizon and the type of questions answered. And it may be far from under management's control (war, geopolitical shocks, etc.). Mistakes that could happen during the execution of a strategic plan are afflicted by large uncertainty because of the time horizon and the type of questions answered. and it may be far from under management's control (war, geo-political shocks, etc). "Strategic risks" refer to these accidents and their possible fallout.

### 2.1.4 Comparison Between Operational, Tactical and Strategic Decisions

*Table 2. 1 Comparison Between Operational, Tactical and Strategic Decisions*

| Decision Level | Examples | Who Makes Decisions |
|---|---|---|
| **Operational Decisions** | • How frequently should I contact with my new colleagues?<br>• What should I tell our new product's customers?<br>• How will I manage my new work responsibilities? | Employees from all levels of the company |
| **Tactical Decisions** | • What should we do to make it easier for employees from the two companies to collaborate?<br>• How should the new product line be promoted?<br>• If we reduce, who should be dismissed? | Managers |
| **Strategic Decisions** | • Should we team up with another company?<br>• Should we look into developing a new product line?<br>• Should we reduce our company? | CEOs, boards of directors, and top management teams |

**Operational Decisions** are those that are made at the most basic level of the organization and are focused on the regular operations of the company. They are typically created by front-line staff members who are in charge of the creation or provision of goods and services. These decisions are routine in nature and frequently involve following predetermined guidelines. They concentrate on short-term objectives and support the organization's efficient operation.

On the other hand, **Tactical Decisions** are made by middle-level managers and are focused on carrying out the strategies developed at the strategic level. These choices need a certain amount of creativity and judgment and are less structured than operational

choices. They assist in the accomplishment of the organization's overall strategic objectives and are centered on medium-term objectives.

**Strategic Decisions** are made by top-level executives and are focused with the organization's long-term development. These decisions are the most difficult to make and are accompanied by the greatest amount of uncertainty. They require a thorough examination of the organization's internal and external environments and require a deep knowledge of market trends and consumer behavior. They support the overall development and sustainability of the organization by concentrating on accomplishing long-term objectives.

In conclusion, operational decisions are made at the lowest levels of the organization and are aimed toward achieving short-term objectives, tactical decisions are made by middle-level managers and are aimed toward achieving medium-term objectives, and strategic decisions are made by top-level executives and are aimed toward achieving long-term objectives.

# Justifying the key elements of business intelligence functionality using specific examples

## 2.2 Business Intelligence Functionalities

### 2.2.1 Descriptive analytics

Data aggregation and data mining are two essential techniques used in descriptive analytics, which is the study of historical data. To find trends and patterns, these are used. It is not the purpose of descriptive analytics to draw conclusions or make predictions based on data. It is more concerned with presenting what has already occurred. Visual data representations, such line, bar, and pie charts, are frequently used to provide descriptive analytics. Moreover, descriptive analytics offers valuable information on its own and frequently serves as the starting point for future analysis. Any conclusions should be simple enough for the larger business audience to understand because descriptive analytics use very straightforward analysis methodologies.

As a result, descriptive analytics are at the heart of many firms' daily reporting. Along with other reporting including inventory, warehousing, and sales data, annual revenue reports are an established form of descriptive analytics. They offer a clear picture of a business' operations and can be simply aggregated. Another popular example is social networking and Google Analytics tools, which summarize particular groupings based on straightforward counts of events such as clicks and likes.

### 2.2.2 Predictive Analytics

With the help of probability and predictive analytics, a more sophisticated data analysis technique may predict potential future events. Prescriptive analytics also involves data mining, just like descriptive analytics. To determine the likelihood of future events based on historical data, it additionally employs statistical modeling and machine learning methodologies. Machine learning algorithms use pre-existing data to form predictions and make an effort to fill in any gaps with the most accurate assumptions.

These predictions can then be utilized to solve problems and discover new growth opportunities. Predictive analytics is being used by businesses, to look for patterns in criminal behavior and avoid fraud. Additionally, businesses can improve the effectiveness of their marketing initiatives by identifying cross-selling opportunities and lowering risk by predicting which customers are most likely to miss payments based on past behavior.

### 2.2.3 Prescriptive Analytics

Prescriptive analytics identifies the optimum course of action for businesses whereas predictive analytics displays the unprocessed effects of potential actions. Prescriptive analytics uses a number of statistical techniques and primarily draws inspiration from computer science and mathematics. Prescriptive analytics emphasizes practical insights rather than data monitoring, although being closely related to both descriptive and predictive analytics. To do this, data is gathered from a variety of descriptive and predictive sources and used in the decision-making process. After that, using algorithms, potential choice patterns are generated and recreated, each of which has a different impact on a company.

Prescriptive analytics are especially helpful since they can assess the effects of a choice based on potential outcomes and then suggest the best course of action to take in order to meet the goals of a company. The use of prescriptive analytics has significant business advantages. Teams can use it to see the best course of action before making decisions, which saves time and money while producing the best results. Also, they help financial

institutions determine how much to cut a product's price in order to draw in more buyers while maintaining high profits.

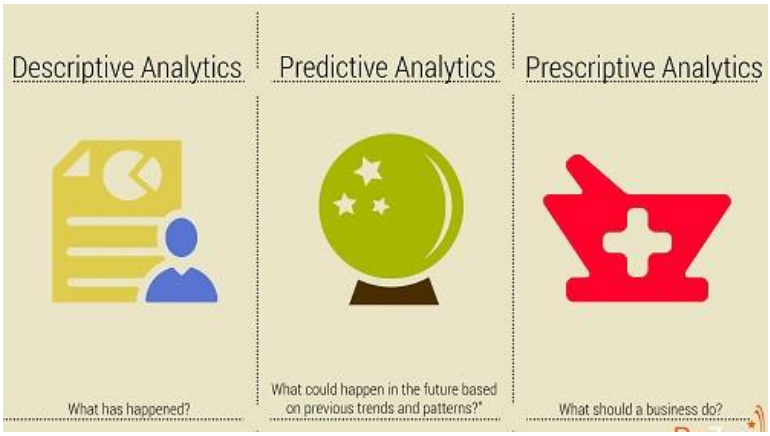



*Figure 2. 2 Descriptive, predictive and prescriptive analytics*

### 2.2.4 Executive Dashboards

Since a few years ago, interactive dashboards with several data visualizations have taken the role of conventional data reporting tools like static Excel sheets. Visual analytics has become essential for businesses to improve performance since the human brain analyzes visual information much more quickly than numerical or textual information. Interactive dashboards collect the most important KPIs in one place, making it easier to track and examine the data. To ensure continuous progress, they can assist in extracting relevant insight.

Business executives receive fast, relevant data from a customized business intelligence dashboard that is simple to understand. As a result, decision-making can be done more quickly and better, and response times to internal and external events can be sped up. Executives require access to customized dashboards that regularly and systematically present KPIs and summary data that are simple to interpret. Executives and business users may both fast and efficiently examine the data that is crucial to them on personalised business intelligence dashboards and take important choices on that information. Furthermore, they can regularly monitor the performance of their business without having to dig through a huge amount of reports.

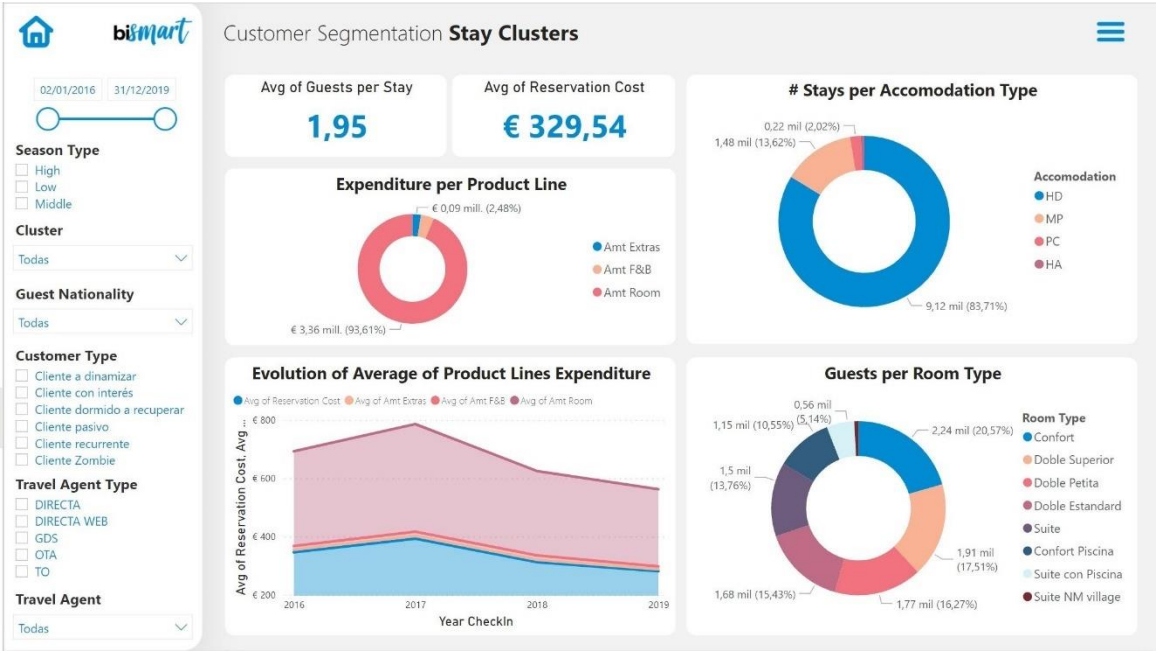



*Figure 2. 3 Executive Dashboards*

## 2.2.5 Location Intelligence

The capacity to visualize and map data in a geographic manner is known as location intelligence. Customers' geographic whereabouts are tracked in real-time data feeds, which can be a useful tool for businesses. Users who have access to location intelligence can better understand consumer behavior patterns and trends, which can assist them in making marketing and sales decisions.

In order for businesses and communities to succeed, more than 90% of executives think that location intelligence is essential. This kind of intelligence is used by executives, managers, and operators to address a variety of needs. Finding the best spots for retail sites, monitoring assets in real time, and maintaining or fixing crucial infrastructure are a few examples of how it is used.

Software for location intelligence is based on GIS (Geographic Information System) technology, which enables users to store, view, and analyze geospatial data in real-time to gain useful insights. Location intelligence technology is a key business intelligence tool that frequently makes use of maps and dashboards to make geospatial findings simple to share with executives and decision-makers. The software allows analysts to mix several

types of data, including supply chain information, CRM (Customer Relationship Management) data, and demographic data.


*Figure 2. 4 Location Intelligence*

### 2.2.6 “What if” Analysis

Businesses can evaluate the possible outcomes of important business decisions before they are actually taken by using "what if" analysis. Making quick, informed decisions from a variety of data is essential for business success. It's crucial to consider both customer behavior and the firm team's expertise in what customers would find interesting when introducing a new product to the product line. But, by employing a what-if analysis strategy, we could anticipate this by taking into account relevant factors like limited product acceptance and setting up a pop-up shop where customers could test the new product.

Users can create strategies to accomplish business goals and stay clear of the standard "hit and miss" strategy using the data that is already available. This supports management's ability to carry out precise strategic planning. To anticipate future events and assess the potential repercussions of various actions, artificial intelligence (AI) can be used. Businesses can use this kind of information to guide their operational and long-term planning decisions. Businesses can also benefit from predictive analytics by better understanding customer behavior and forecasting future trends.

### 2.2.7 Interactive Reports

Users can turn data into knowledge with the help of interactive reports. Users can utilize them to promote better decision-making by better understanding the analysis contained in reports and the underlying data that reports are based on.

The user should be able to perform the following tasks with Interactive Reports:

- Examine reports in depth
- Do slice-and-dice OLAP analysis.
- Use analysis to illustrate data trends, such as trend lines and correlation
- Examine big data sets using time-series zooming to identify data anomalies.
- Data alerts that highlight data exceptions can be set using conditional formatting.

### 2.2.8 Self-Serve Reporting

Due to the complexity of traditional business intelligence, only a small number of workers inside an organization possess the technical know-how necessary to create and maintain reports. This can put a lot of pressure on resources and cause bottlenecks to build around these important people, slowing down the reporting process as a whole. For this reason, while assessing potential reporting solutions, self-service reporting ought to be one of the essential business intelligence elements to look for. Without the above-mentioned necessary technical knowledge, consumers can quickly and simply generate effective reports using a self-service reporting solution like Matillion BI.

### 2.2.9 Automatic Report Scheduling

It is crucial to have the capacity to quickly and simply create attractive reports. These reports are useless if they remain unread and do not get to the people who could benefit from them the most.As a result, one of the essential business intelligence capabilities that should demand from a business intelligence and reporting system is report scheduling.

The Matillion BI Report Scheduler may automatically email reports in a variety of file formats to individuals and groups both inside and outside of the organization. Moreover, Matillion BI Report Scheduler offers iReport features, which let users design more intricate, pixel-perfect reports.

### 2.2.10 Ranking Reports

By choosing particular criteria, this tool allows the creation of reports that list specific types of data across various dimensions. Ranking reports make it possible to see which areas of a company are performing best and worst. We could, for instance, produce a report that lists the top 10 salespeople, regions, or goods in each of our 10 categories. Reports can be wrong for a variety of reasons, one of which being human error. Ranking reports can help businesses automatically rate various data sets in order of specific relevance and give their end users the ability to quickly and easily choose which data sets require greater attention.

### 2.2.11 Self-Service Business Intelligence (BI)

Business users can access and examine data sets using self-service business intelligence (BI), a method of data analytics, even if they are unfamiliar with BI or closely related processes like data mining and statistical analysis. Without contacting the BI and IT professionals of a business, users can filter, organize, analyze, and visualize data using self-service BI tools. Self-service BI capabilities are implemented by organizations to

make it simpler for staff members, from executives to frontline workers, to gain actionable business insights from the data gathered in BI systems. The main objective is to promote better decision-making that leads to advantageous company outcomes, including increased effectiveness, improved customer satisfaction, and more revenue and profitability.

### 2.2.12 Integration with other systems

Each data technology solution must include data integration as a key component. Data integration makes it possible to quickly access all the information required to make smart business decisions. Moreover, data integration makes it possible to aggregate and convert different data sources for precise analysis. Business users can swiftly decide what actions need to be performed thanks to the insights that come from contextualizing data, which are extremely valuable. These insights can also result in new company opportunities, more effective operations, chances for growth, and more.

A successful data integration plan must include cloud-based architecture as a fundamental element. This is due to a very basic reason. By the use of cloud-based solutions, businesses can coordinate their operations around a single source of truth while also normalizing their data across many platforms and systems. Also, a cloud-based application enables real-time decision-making using a variety of data sources.

### 2.2.13 Cross-Platform Compatibility

With the help of this functionality, users may access dashboards from any place or device that has an internet connection. In this way, the dashboards and analytics we provide will always be accessible. Such as even putting them on a larger screen to assist a business meeting while we are away from the office. Data can be accessed from a desktop computer, tablet, laptop, smartphone, or any other device with just a basic internet connection. Once our sources are connected, interactive internet dashboards provide real-time data that keeps us informed of everything that occurs in our organization. No longer

do we have to worry about manually updating them because the tool will give us new information as soon as it becomes available.

### 2.2.14 Customizable Dashboards and Reports

Reshaping the way data is presented is a fantastic technique to gain quick understanding of the data. The numerous customizable reports and dashboards that are frequently included with business intelligence tools enable users to quickly spot significant data trends. Simple reports that highlight significant data trends over time or more elaborate reports that offer a thorough study of our data can both reveal insightful information. The Customized dashboards feature is a crucial feature of business intelligence solutions since it gives us complete control over dashboards.

With this feature, dashboards may be tailored to match the corporate identity of the company by altering the colors, fonts, backdrops, charts, texts, symbols, etc. Also, we can create our own themes and then quickly integrate them into all of our dashboards with just a few clicks. These predefined dashboard themes will adhere to our data story.

### 2.2.15 Cloud-Based Business Intelligence (BI)

The process of converting data into useful insights partially or entirely within a cloud environment is known as cloud-based business intelligence, or cloud BI. Without the expense or trouble of purchasing physical hardware, cloud BI provides businesses with the knowledge they need to make data-driven choices.

Today, it's impossible to find a company that doesn't use at least one cloud-based application. Applications for managing client relationships (CRM), internet - based collaboration tools, online data storage, and even certain help desk software are a few examples. It makes obvious that businesses would seek a cloud solution for their business intelligence. Creating insights that can be put to use is the core of business intelligence. The key is to deliver the appropriate information to the appropriate stakeholders at the

appropriate time. The incorporation of the cloud to this procedure is great. It offers a quick, scalable means to handle, deliver, store, and access data.

### 2.2.16 Advanced Security

A business intelligence solution must have the ability to store and retrieve data securely in addition to providing data in a visual format. Businesses need a system that can prevent unauthorized access to their data because collecting, filtering, cleaning, and organizing data may be time-consuming and challenging.

Security is without a doubt one of the most discussed aspects of business intelligence, especially when it comes to Cloud BI solutions. Businesses have traditionally preferred on-premise business intelligence solutions due to security concerns. These worries are starting to go away though as vendors provide more sophisticated and robust security measures. The security is one of the most crucial aspects of business intelligence. We can precisely regulate who can access what due to integrated advanced security BI. Row and column based security, along with groups and roles, can be used to ensure that a user only sees the data they need to see. We can share BI in this way with managers, staff members, suppliers, or even clients.

### 2.2.17 Mobile Access

Mobile BI is defined as the access and utilization of information through mobile devices. Mobile BI is capable of effectively bringing business information and analytics closer to the user due to the growing use of mobile devices for business. With mobile BI, information can be accessed practically anywhere and at any time, whether on a train, in the airport departure lounge, or during a meeting break.

Mobility is now one of the essential business intelligence characteristics in the workplace. It is no longer a luxury. It is essential that busy executives can quickly access management information from everywhere they are using a variety of various devices,

including mobile and tablets. The market for these products is expected to have grown by 42% in 2013, as a result of the enormous increase in demand for mobile BI capabilities. One of the most significant business intelligence aspects will continue to be this number, which is only predicted to increase over the next few years.

## 2.2.18 OLAP

Many Business Intelligence (BI) systems use the OLAP (Online Analytical Processing) technology. With its capacity for endless report viewing, intricate analytical computations, and predictive "what if" scenario (budget, prediction) making plans, OLAP is a potent technology for data discovery. Business data is subjected to multidimensional analysis using OLAP, which also offers the capacity to execute complex computations, trend analysis, and sophisticated data modeling.

Business Performance Management, Scheduling, Budgeting, Planning, Financial Analysis, Statistics, Modeling Techniques, Knowledge Discovery, and Data Warehouse Reporting are just a few examples of the various business applications that are built on it. End users can execute ad hoc analyses of data in various dimensions using OLAP, which gives them the knowledge and insights they need to make better decisions.

## 2.2.19 Data Slicing and Dicing operation of OLAP

A computer procedure called OLAP (Online Analytical Processing) enables users to choose and retrieve data from many angles. OLAP databases frequently use the term "slicing and dicing" to describe how they provide data to users in multidimensional cube format, much like a 3D spreadsheet (called an OLAP cube). The OLAP cube is made up of measures, which are numerical data that are grouped by dimensions.

Slicing and dicing describes a method for grouping, displaying, and understanding data in a database. To gather the necessary degree of detail for accurate analysis, large blocks of data are divided into smaller parts, and the procedure is repeated. As a result, slicing and

dicing the data gives it new and different viewpoints as well as a deeper look for analysis. For instance, a report may describe the annual performance of a specific product.

Slicing involves focusing on a single value of a dimension and creating a new data cube with that dimension removed. Dicing is the process of creating a new data cube by selecting particular values from multiple dimensions. Drilling down to the quarterly level requires a slicing and dicing method. We can utilize the slicing and dicing method to drill down to the quarterly level if we want to view the quarterly results.

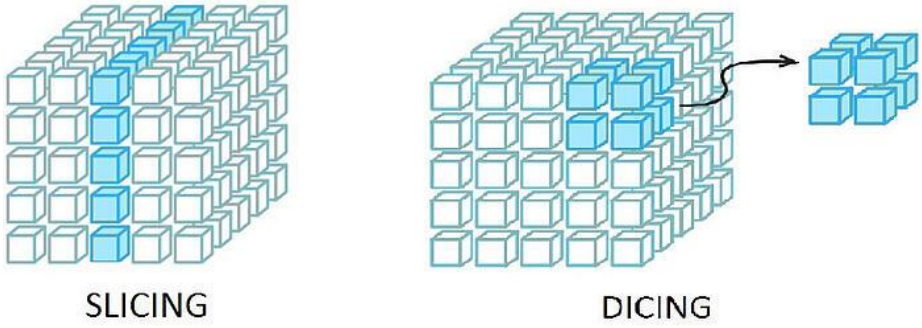



*Figure 2. 5 Data Slicing and Dicing operation of OLAP*

## 2.2.20 Data Mining in Business Intelligence

Data mining is important to business since it is used to transform unprocessed data into insights that can be used for decision-making. Data engineers use tools to find trends that help them analyze customers. To identify relevant variables that have an impact on revenue lines, data sets are compared. This allows for the optimization of marketing campaigns as well as the development of strategies and actions to boost sales. Data mining is frequently mistaken with data analysis and business intelligence due to the subject matter's overlap with data operations. But each term is distinct from the other.

Data analysis is the method used to identify patterns from the collected information, whereas data mining refers to the process of obtaining information from huge data sets. Examining, filtering, manipulating, and modeling data are some of the phases involved in data analysis. Finding information, making inferences, and acting on them are the goals. Businesses can produce useful and reliable information about their products and services by using techniques like data mining and data analysis, which combine to form business intelligence.

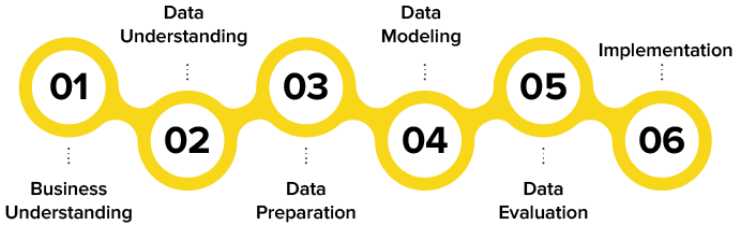



*Figure 2. 6 Data Mining in Business Intelligence*

One of the many analytical tools for analyzing data is data mining software, which enables users to see data from a variety of viewpoints, classify it, and summarize the connections identified. Data mining's ultimate objectives are prediction and discovery. The method looks for patterns and orderly relationships between variables, then uses the patterns to analyze fresh samples of data to validate the results.

There are five main components to data mining:

- Gather, modify, and add transaction data to the data warehouse
- Use a multidimensional database system to store and manage the data.
- Provide business analysts and IT specialists access to data
- Use application software to analyze the data.
- Provide the information in an efficient manner (graph, table, etc.)

## 2.3 Justify the key features of business intelligence functionality of Yard of Ale's beverage company

In conclusion, the BI functionality is important for Yard of Ale's beverage business because it offers insightful data on the operation of the company. And this offers a competitive advantage and assists in making smart decisions. Yard of Ale's is able to gather insights into trends and market demands by evaluating data from a variety of sources, including sales, inventory, and customer behavior. This assists in simplifying company processes, recognizing areas for development, and forming well-informed judgments based on current information.

Additionally, BI tools offer comprehensive reporting and visualization features that make it simple to comprehend complex data and locate important performance measures. This makes it possible for the management team at Yard of Ale to monitor performance and make data-driven decisions in regard to recent patterns. Yard of Ale's is able to predict changes in customer preferences, supply demands, and sales patterns due to the planning and forecasting capabilities of BI tools. The business can plan and optimize its processes, prevent expensive errors, and increase profitability by making predictions about the future.

Another key component of BI is competitive analysis, which enables Yard of Ale's to study the performance, market trends, and consumer behavior of its rivals. The company can improve its competitive advantage by recognizing opportunities for improvement in the market and by creating new strategies. Finally, by delivering the right data insights to all stakeholders, BI tools help Yard of Ale's teams collaborate more successfully. This promotes a culture of data-driven decision-making by bringing all teams and departments together around common goals.

In conclusion, key features of BI functionality is essential for Yard of Ale's beverage business since it offers insightful data on the operation of the enterprise. Also, this gives one a competitive advantage and facilitates the ability to make informed decisions. Yard of Ale's can boost profitability, improve productivity, and cut expenses by employing BI tools that include key features. Additionally, these BI tools assist the business in

developing new strategies, planning and optimizing its operations, and anticipating future trends.

In short, Yard of Ale's needs BI tools and its key features to accomplish its objectives and maintain a competitive advantage in the industry.

# Range of information systems and technologies that can be used to support organizations at its decision levels

## 2.4 Information Systems and Technologies that support organizational levels

### 2.4.1 Types of systems in a company

There are several types of systems since there are different kinds, interests, and specialties within an organization. An organization cannot get all the information it requires from a single system. Information systems can be divided into three basic groups based on the organizational level they serve (operational, tactical, and strategic levels).

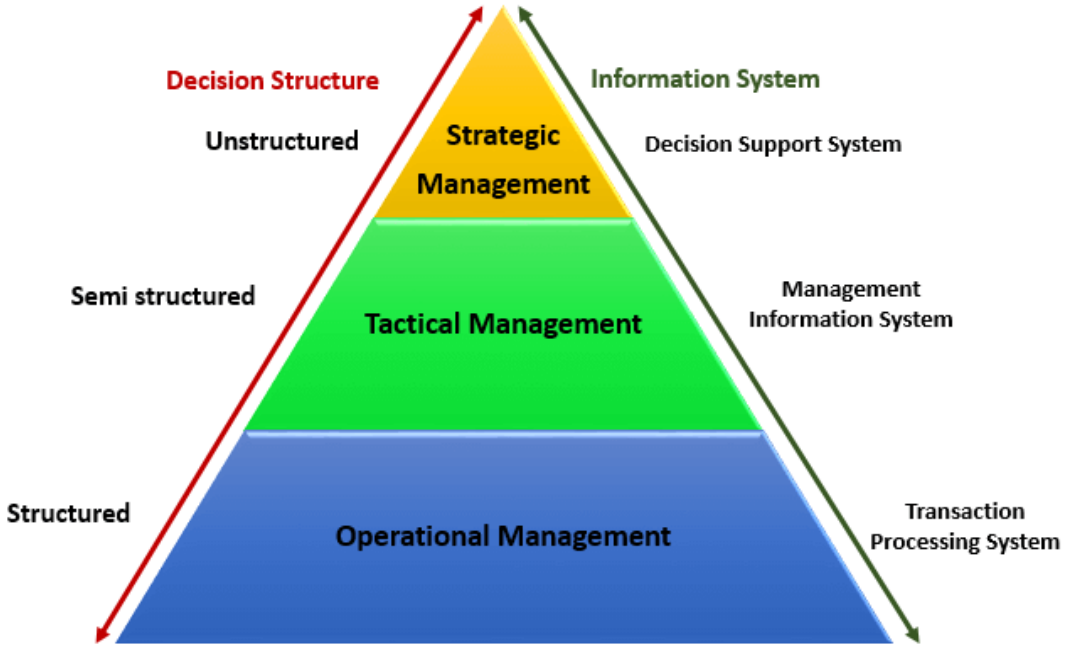



*Figure 2. 7 Pyramid Diagram of Organizational levels and information requirements*

Systems at the operational level help operational managers by monitoring the fundamental business activities and transactions. Sales, revenues, cash transactions, payroll, financing decisions, and the movement of products inside a manufacturing are examples of such operations. At this level, systems primarily serve the functions of tracking transaction flow through the organization and providing routine answers to questions. such as calculating the number of items in stock or determining the customer's payment status. Information must typically be readily available, up to date, and correct to be able to respond to these types of questions. Systems that record bank deposits from ATMs and measure the number of hours worked each day by staff on a factory floor are two examples of operational-level systems.

Middle managers use management-level systems to support their monitoring, regulating, decision-making, and administrative tasks. Such systems' main goal is to identify what is working well. Systems at the management level often offer periodic reports rather than real-time data on activities. Systems at the management level help nonroutine decision-making in some situations. They frequently focused on less organized solutions when the information required are not always obvious. These systems frequently provide "what-if" answers, such as what might happen to production planning if sales in December doubled or what would happen to our investment return if a manufacturing timetable were postponed for months. These queries frequently call for both fresh data from within the company and data from outside that is difficult to access via operational-level tools already in place.

Senior management may face and address long-term trends and strategic concerns both within the company and in the external environment with the help of systems at the strategic level. Their main concern is balancing changes in the external environment with the capabilities of the current organizational structure. Systems at the strategic level are used to find solutions to questions like what will the status of employment levels be in five years, long-term cost patterns in the market, and what kinds of products should we be producing in that time and so on.

Hence, there are 4 main types of systems at each level of a company.

1) Transaction Processing Systems (TPS)
2) Management Information Systems (MIS)
3) Decision Support Systems (DSS)
4) Executive Support Systems (ESS)

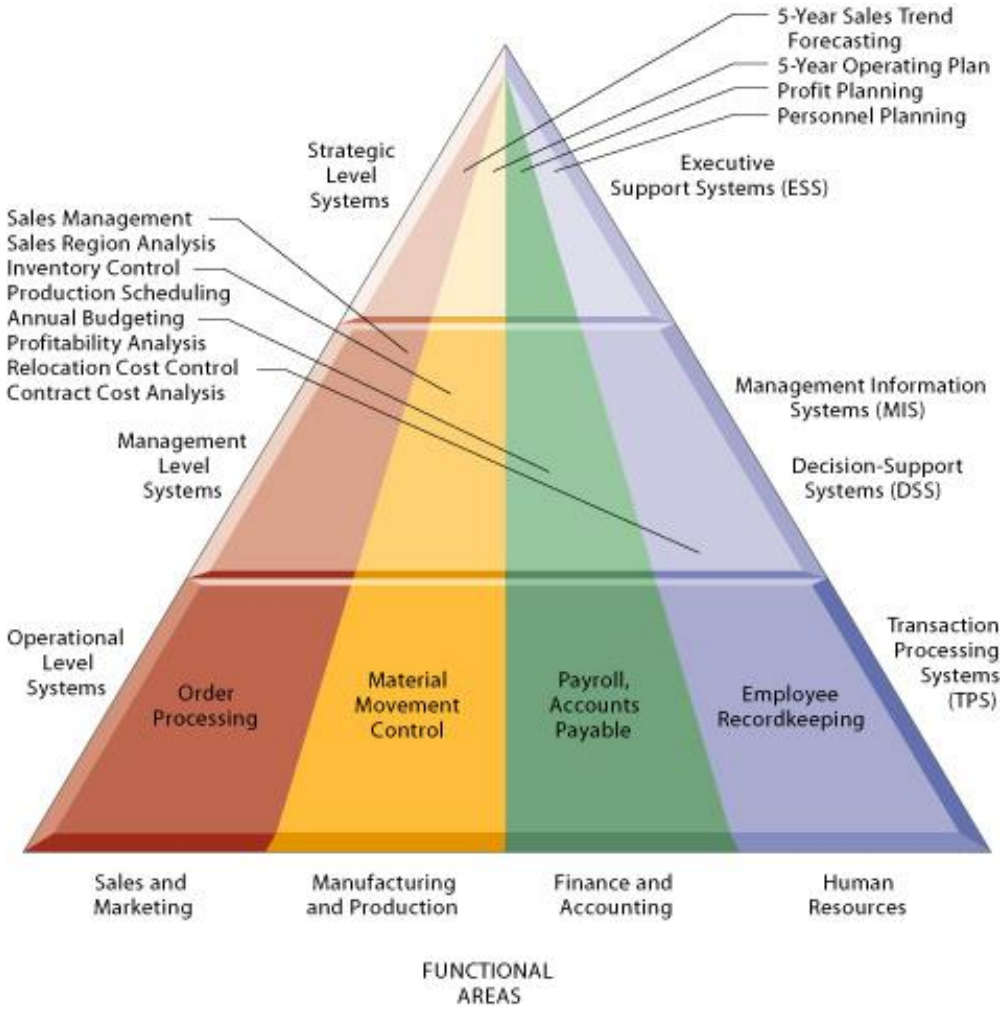



*Figure 2. 8 Types of information systems*

## 2.5 The 4 main types of systems at each level of company

### 2.5.1 Transaction Processing Systems (TPS)

To keep track of the organization's daily business transactions, transaction processing systems are used. The operational management level users use them. To provide routine answers to inquiries like the ones below is the primary goal of a transaction processing system.

The TPS system immediately answers the questions below by keeping track of daily business transactions as mentioned below.

- How were beers sold today?
- How much beer stock do we currently have?
- How much is Ryan Wickramaratne still owed?

When products, services, or money are transferred from one person, account, etc. to another, it is said to have taken place in a transaction. Customer orders, purchase orders, and invoice management are just a few examples of these processes or transactions. Hence, a TPS is in charge of gathering, storing, updating, and retrieving data related to the transactions that have occurred in an organization, and it also produces reports that are used by other levels of management. Performance, dependability, and consistency are qualities of a TPS.

Employees at the bottom of the organizational structure typically use transaction processing systems at the operational level. A TPS might be a supermarket point of sale system like Nakumatt (Kenyan supermarket chain), which is used to record each sale transaction that occurs there. A log of all transactions can be produced from the TPS at the end of the day to see which products were sold.

TPS system consists of the following procedures and objects:

- Input: Transactions and events as input
- Processing: Filtering, listing, integrating, and modifying
- Output: Comprehensive reports, lists, and summaries
- Users: Workers in operations and supervisors

TPS examples include the following:

- Point of Sale Systems: Systems that keep track of everyday sales.
- Payroll systems: Managing loans, handling employee salaries, etc.
- Stock Control systems: Monitoring stock levels.
- Airline booking systems: Flight booking management systems for airlines.

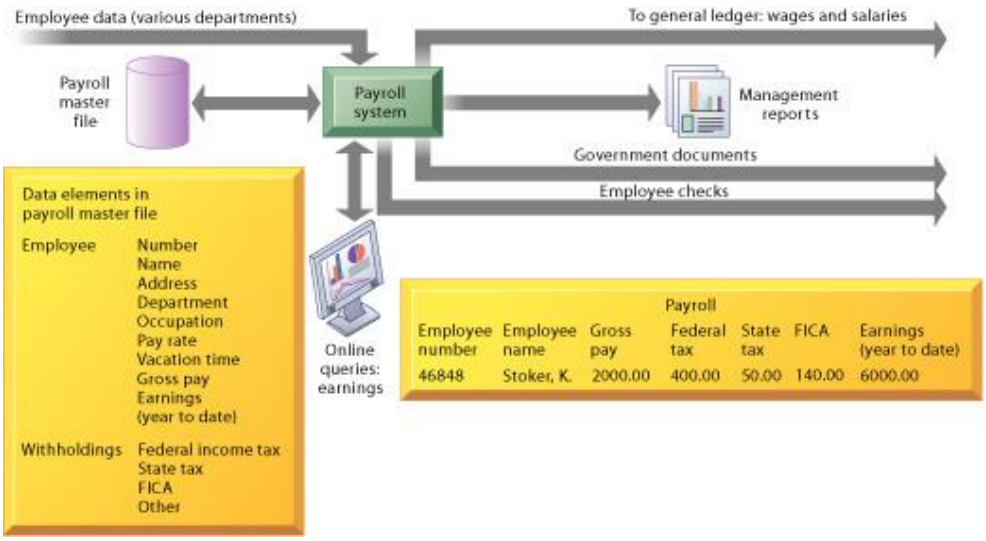



*Figure 2. 9 Symbolic representation for a payroll TPS*

The payroll TPS shown in the above figure is a standard accounting transaction processing system used by most businesses. The amount of money paid to employees is monitored by a payroll system. Data elements, often known as discrete pieces of information (such as name, address, or employee number), make up the master file. The system receives data input, which updates the data elements. The components on the master file are put together in a variety of ways to create reports that are interesting to management and governmental organizations, as well as to mail employees' paychecks.

These TPS can produce different report combinations using the already available data elements.

| Types of Systems | | | | | |
|---|---|---|---|---|---|
| Column1 | Sales/marketing systems | Manufacturing/production systems | Finance/accounting systems | Human resources | Other types (e.g., university) |
| **Major functions of system** | Customer service | Scheduling | General ledger | Personnel records | Admissions |
| | Sales management | Purchasing | Billing | Benefits | Grade records |
| | Promotion tracking | Shipping/receiving | Cost accounting | Compensation | Course records |
| | Price changes | Operations | | Labor relations | Alumni records |
| | Dealer communications | | | Training | |
| **Major application systems** | Sales order information system | Machine control systems | General ledger | Employee records | Registration system |
| | Sales commission system | Purchase order systems | Payroll | Benefit systems | Student transcript system |
| | Sales support system | Quality control systems | Accounts receivable/payable | Employee skills inventory | Curriculum class control systems |
| | | | Funds management systems | | Alumni benefactor system |

*Figure 2. 10 Typical applications of TPS*

The image above shows some examples of typical TPS applications. Five distinct functional categories for TPS are shown in the figure. A manufacturing TPS is illustrated by the parcel tracking system used by United Parcel Service (UPS). Delivery services for packages are offered by UPS. All package shipment transactions are tracked by the TPS system.

Descriptive analytics are frequently used by TPS (Transaction Processing System) users to track and examine operational data associated with transactions, such as sales, purchases, or inventory levels. Descriptive analytics can assist TPS users in understanding trends and patterns in transaction data, such as peak sales seasons or inventory shortages, and taking suitable corrective measures as needed.

### 2.5.2 Management Information Systems (MIS)

Tactical managers utilize management information systems (MIS) to keep track of the organization's present performance level. A management information system receives its input from the output of a transaction processing system. The tactical managers use the reports that the MIS system generates to monitor, regulate, and forecast future performance by routinely analyzing the data with algorithms that aggregate, compare, and summarize the findings. For instance, data from a point-of-sale system can be utilized to examine trends in the sales of both successful and unsuccessful products. Future inventory orders can be made using this information, increasing orders for products that are performing well and decreasing orders for unsuccessful products.

Systems, information, and people (the management) are all combined in one system (both hardware and software). In an organization, this kind of system is crucial since it offers data that is necessary for the management, operations, and decision-making processes. Planning, controlling, making decisions, coordinating, and staffing are a few of these duties. In the tactical level of the organizational management hierarchy, employees who are at the middle level typically use management information systems.

An example of a MIS is the Student Management Information System (SMIS) at the University of Nairobi, which may be used to generate reports regarding a student's registration status in order to identify who is qualified to take the end-of-semester exams.

MIS system consists of the following procedures and objects:

- Input: High-volume data, basic models, and summary transaction data.
- Processing: Routine reports, basic models, and low-level analyses are processed.
- Output: Reports on summary and exceptions are produced.
- Users: Mid-level manager

MIS examples include the following:

- Sales management systems: Systems used for sales management receive data from point-of-sale systems.
- Budgeting systems: The company's monetary spending in both the short and long terms is outlined by the budgeting systems.
- Human resource management system: General employee well-being, staff turnover, etc.

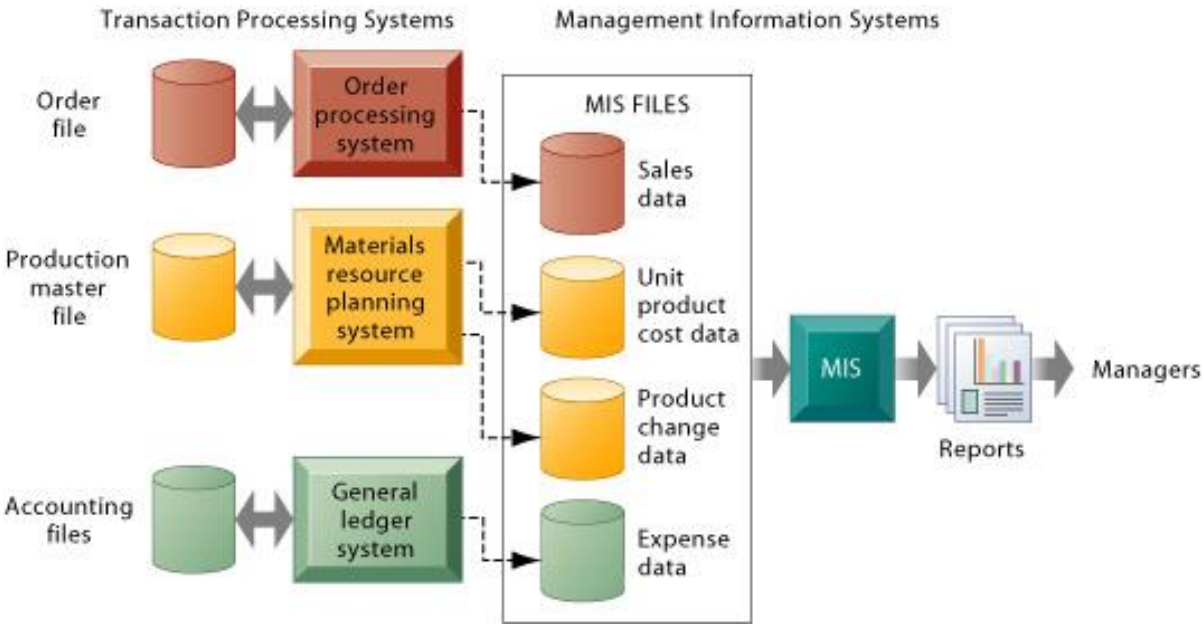



*Figure 2. 11 How the TPS of the organization is used to provide data to Management Information Systems (MIS)*

The illustration above demonstrates how a typical MIS converts transaction-level data from accounting, production, and inventory into MIS files that are then utilized to generate reports for management. The three TPS in the system shown in this diagram deliver compressed transaction data to the MIS reporting system at the conclusion of the time frame. The MIS, which gives managers the necessary reports, gives them access to the organizational data.

| PRODUCT CODE | PRODUCT DESCRIPTION | SALES REGION | ACTUAL SALES | PLANNED | ACTUAL versus PLANNED |
|---|---|---|---|---|---|
| 1 | Strong Beer | Northeast | 4,066,700 | 4,800,000 | 0.85 |
| | | South | 3,778,112 | 3,750,000 | 1.01 |
| | | Midwest | 4,867,001 | 4,600,000 | 1.06 |
| | | West | 4,003,440 | 4,400,000 | 0.91 |
| | TOTAL | | 16,715,253 | 17,550,000 | 0.95 |
| | | | | | |
| 2 | Stout Beer | Northeast | 3,676,700 | 3,900,000 | 0.94 |
| | | South | 5,608,112 | 4,700,000 | 1.19 |
| | | Midwest | 4,711,001 | 4,200,000 | 1.12 |
| | | West | 4,563,440 | 4,900,000 | 0.93 |

*Figure 2. 12 Example MIS Report for Yard Ale Company*

The figure above shows an example report generated by the system mentioned above. The MIS generated this report using statistics on annual sales that have been compressed. Although some MIS allow managers to drill down to view daily or hourly data if necessary, most MIS serve managers who are primarily interested in weekly, monthly, and yearly performance.

Users of MIS (Management Information Systems) frequently employ descriptive analytics to produce reports and give managers knowledge of the operation of the company. Information about a variety of business aspects, including sales, marketing, finances, and operations, can be found in MIS reports. Users of MIS can benefit from descriptive analytics by being able to track performance, spot trends and patterns, and base choices on the data in the reports.

### 2.5.3 Decision Support Systems (DSS)

Senior management uses decision support tools to make complex decisions. Both internal (such as transaction processing systems and management information systems) and external systems provide input to decision support systems. The primary goal of decision support systems is to offer solutions to challenges that are unique and change constantly. Decision support systems are highly interactive and use complex mathematical models and statistical methods (probability, predictive modelling, etc.) to deliver solutions.

The following are some questions that Decision Support Systems respond to:

- If the factory's output lot was doubled, how would it affect the productivity of the workers?
- If a new competitor entered the market, what would happen to our sales?

DSS system consists of the following procedures and objects:

- Input: external data from market research reports, internal data from company database, and user-generated data from polls or social media.
- Processing: Generating information that can be used for decision-making by analyzing the input data. This procedure may involve modeling, simulation, data mining, statistical analysis, and optimization. Depending on how the DSS is being used, several processing algorithms and methods may be used.
- Output: Users may better understand complex data and make decisions by using a variety of reports, charts, graphs, and data visualizations.
- Users: Executives, managers, or analysts, as well as individuals or organizations from various organizational levels. External users like partners, suppliers, or customers may also use DSS.

DSS examples include the following:

- Financial planning systems: Systems for financial planning give managers the ability to assess alternative strategies for reaching objectives. The goal is to identify the most effective method of accomplishing it. For instance, the formula Total Sales less (Cost of Goods + Expenses) can be used to determine a company's net profit. Senior executives will be able to choose the most effective course of action by asking realistic questions and making adjustments to the numbers for total sales, cost of goods, etc. using a financial planning system.
- Bank loan management systems: Bank loan management systems are employed to assess the borrower's creditworthiness and forecast the possibility that the loan will be repaid.

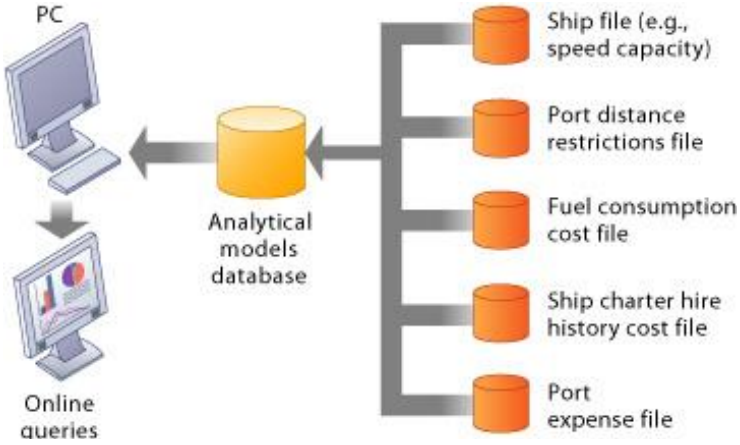



*Figure 2. 13 Yard Ale-estimating decision-support system*

The DSS designed for a company is shown in the above figure (Yard Ale-estimating decision-support system). The system runs on a powerful desktop computer and offers a menu system that makes it simple for users to enter data and retrieve information. A powerful Computer powers this DSS. Managers that have to generate proposals for shipping contracts can use it every day.

Users of DSS (Decision Support Systems) can evaluate data and come to decisions using both descriptive and predictive analytics. While predictive analytics can be used to spot trends and predict future results, descriptive analytics can give a general summary of the data that is now available. Users of DSS can also make use of "what-if" analysis, a kind of prescriptive analytics that enables them to simulate various situations and assess the potential effects of various choices.

### 2.5.4 Executive Support Systems (ESS)

Executive Support Systems, also known as ESS, are special decision support tools created to assist senior-level executives in reaching strategic decisions. Executives get quick and simple access to vital information on the performance of the company, industry trends, and other pertinent data because of ESS. Typically, the system has a dashboard interface with real-time key performance indicators (KPIs) and other metrics. Drill-down features offered by ESS allow executives to explore underlying data and spot potential issues or opportunities. Internal company data, outside market information, and industry benchmarks are just a few of the data sources that ESS frequently integrates. ESS helps executives make better-informed decisions, increase business performance, and gain a competitive advantage by giving them fast access to important details.

The ESSs typically use other Management Information Systems (MIS) at the lower level of management, like the Transaction Processing System (TPS), to extract summary data. An expert system or knowledge-based system that can be utilized for sales forecasting and possibly result in a revision of business strategy is an example of an executive support system. Senior managers and other personnel at the highest (strategic) level of the organizational management hierarchy typically find use for executive support systems.

The following are some questions that Executive Support Systems respond to:

- What line of work should we pursue?
- What are our competitors up to?
- In order to gain market share, what fresh purchases should we think about?

ESS system consists of the following procedures and objects:

- Input: Both internal and external aggregated data
- Processing: Interactive, simulation, and graphic
- Output: Projections and query answers are produced.
- Users: Senior Managers

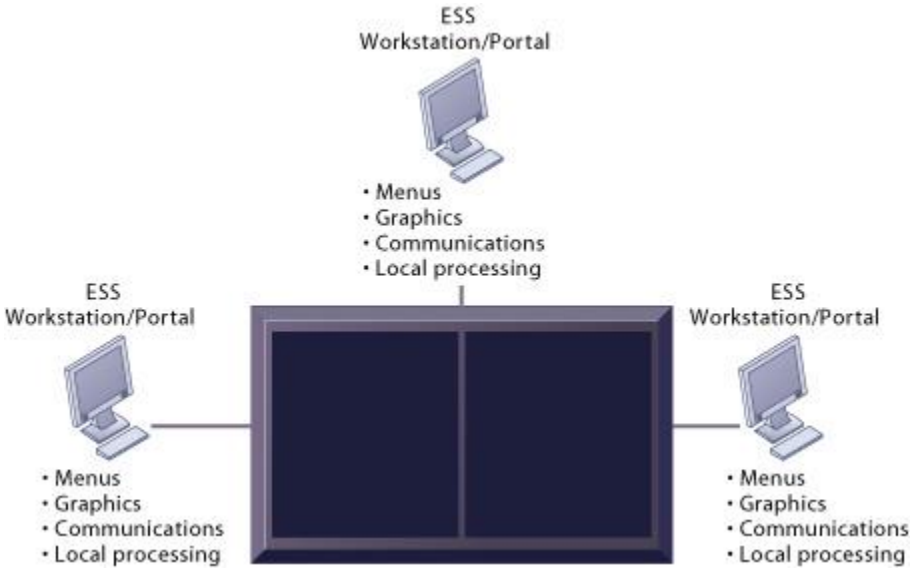



*Figure 2. 14 Model of a Yard Ale executive support system*

The model of a Yard Ale executive support system is shown in the above figure. Executives can access the data from a variety of internal and external sources using this system, which compiles the information into an accessible format.

Users of the ESS (Executive Support System) can get insights and make strategic decisions by utilizing all three forms of analytics: descriptive, predictive, and prescriptive. Predictive analytics can assist ESS users in predicting future trends and locating new opportunities or dangers, while descriptive analytics can assist users in understanding the existing status of the organization. Prescriptive analytics can suggest the appropriate course of action to take in order to accomplish particular objectives.

## 2.6 Compare and contrast types of systems in a company

### 2.6.1 Comparison of types of systems in a company

The relationship between TPS, MIS, DSS, and ESS is further explained in the table that has been shown below.

*Table 2. 2 Comparison of types of systems in a company*

| | TPS | MIS | DSS | ESS |
|---|---|---|---|---|
| **Stand for** | Transaction Processing Systems | Management Information Systems | Decision Support Systems | Executive Support Systems |
| **Designed to** | Designed to capture, record, and process everyday transactions such as sales, transactions, and inventory changes. | Designed to deliver reports and information to middle-level managers to help them make decisions. | Designed to assist managers and analysts in making better-informed decisions by evaluating data and delivering insights. | Designed to supply strategic data to senior-level executives to help long-term planning and monitor success. |
| **Users** | operational employees like salespeople, cashiers, and warehouse workers. | Middle-level managers who require data to oversee the day-to-day operations of the business | Managers and analysts | Senior-level executives |
| **Data Type** | Structured data | Structured data | Structured and unstructured data | External and internal data |

| | | | | |
|---|---|---|---|---|
| **Major Functions** | Capture, save, and handle everyday transactions. | Produce reports and supply data for making decisions. | Data analysis, decision support, and what-if analysis. | Provide strategic data, keep an eye on progress, and assist with long-term planning. |
| **Example** | Point of sale (POS) system, inventory management system. | Sales report, financial statement. | Business intelligence system, forecasting system. | Dashboard, strategic planning system. |
| **Inputs** | Transactions of events. | Transaction summary data of high-volume data and simple models. | Low-volume data or massive databases optimized for data analysis of analytic models and data analysis tools. | Aggregate data of external and internal data. |
| **Processing** | Sorting, listing, merging and updating. | Routine reports, simple models and low-level analysis. | Interactive, simulations and analysis. | Graphics, simulations and interactive. |
| **Outputs** | Detailed reports, lists and summaries. | Summary and exception reports. | Special reports, decision analysis and responses to queries. | Projections and responses to queries. |

## 2.6.2 Interrelationship of types of systems in a company (TPS, MIS, DSS and ESS)

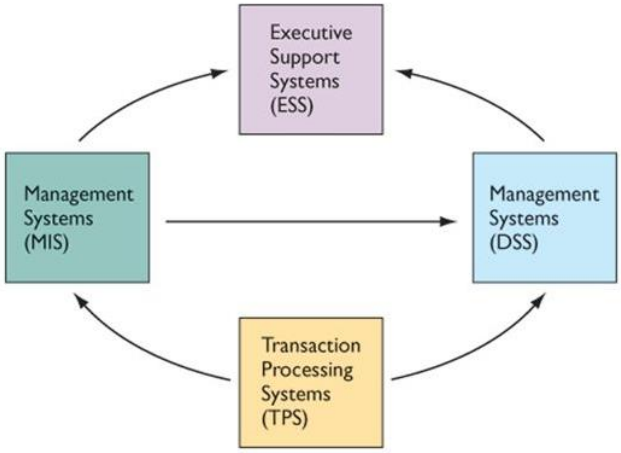



*Figure 2. 15 Interrelationships among TPS, MIS, DSS and ESS systems*

The diagram above shows the connections between the systems supporting the various organizational levels. While ESS are largely a recipient of data from lower-level systems, TPS are typically a significant data source for other systems. Data sharing across the other system types is also possible.

Data can also be shared between systems supporting various functional domains. For instance, a sales system may send an order it has received to a manufacturing system as part of a transaction so it can produce or deliver the goods indicated in the order, or it may send it to a MIS for financial reporting. Interdependencies exist among the organization's numerous system types. TPS are significant generators of the data needed by other systems, which in turn generate data for other systems. In the majority of enterprises, these various system types have been weakly connected.

Integration of these technologies will undoubtedly benefit the company by facilitating information exchange across departments and giving management a comprehensive understanding of the organization's performance as a whole. Nevertheless, integrating numerous systems takes a lot of time and effort, and it is also very expensive. This poses a significant challenge for large businesses because they frequently have to manage hundreds or even thousands of separate applications that serve various levels and business functions.

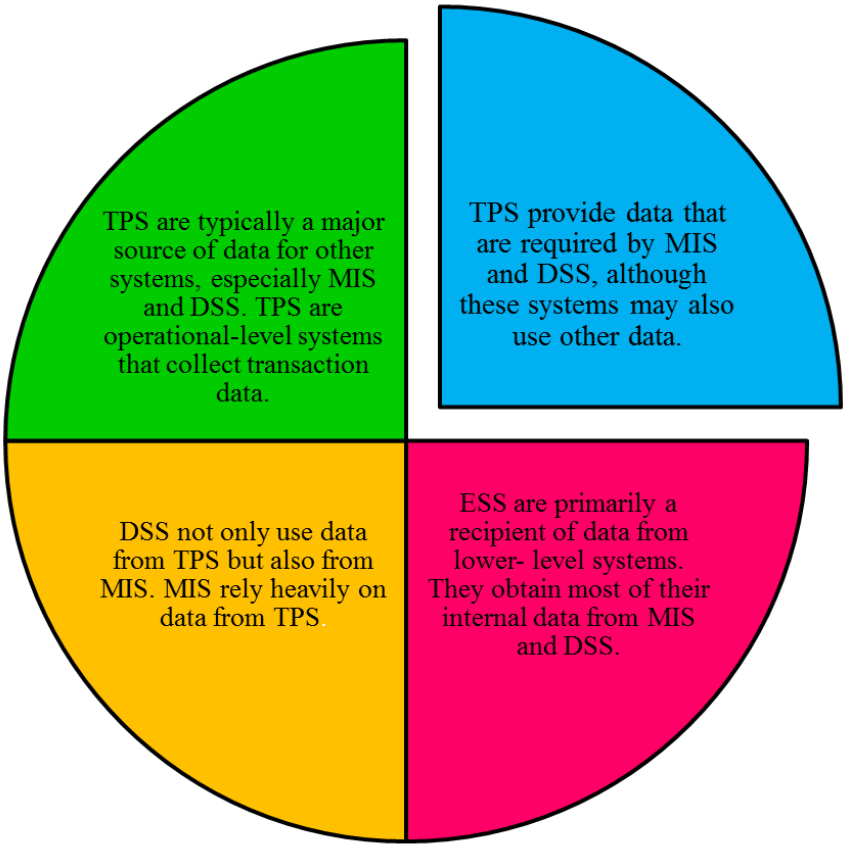



*Figure 2. 16 Interrelationship of types of systems in a company*

**TPS** → The data that MIS, DSS, and ESS use is produced by TPS. There wouldn't be any data to analyse, examine, or report without TPS.

**MIS** → Managers and analysts can use MIS to get the data they need to make decisions. Senior level executives in ESS can use reports produced by MIS.

**DSS** → Data is analyzed by DSS to provide insights and enhance decision-making. Moreover, DSS can employ MIS data to give managers additional in-depth analyses and suggestions.

**ESS** → Senior-level executives can get strategic information from ESS to help long-term planning and track performance. Executives can receive real-time information and insights from ESS using data from MIS and DSS.

## 2.7 Conclusion

In order to support various levels of decision-making within an organization, TPS, MIS, DSS, and ESS collaborate. TPS supplies the raw data, MIS processes it and generates reports, DSS does insights-based analysis on the data, and ESS offers strategic data to assist long-term planning and performance monitoring. Given that each of these systems contributes to the entire decision-making process, the interplay between them is essential to an organization's success.

# Explaining what is business intelligence, and what are the tools and techniques that go with it with examples

## 3.1 What is Business Intelligence

Business intelligence (BI) refers to a collection of procedures, frameworks, and tools that transform unprocessed data into actionable knowledge that helps businesses operate profitably. It is a collection of tools and services for converting data into knowledge and information that can be used. The strategic, tactical, and operational business decisions of a company are directly impacted by BI. Instead of relying on assumption and emotion, BI encourages fact-based decision making utilizing historical data. Data analysis is carried out by BI tools, which also produce reports, summaries, dashboards, maps, graphs, and charts to give users a thorough understanding of the nature of the business.

The end goal of BI initiatives is to encourage better business decisions that allow firms to boost revenue, enhance operational effectiveness, and gain an advantage over competitors in the market. In order to accomplish that, BI combines analytics, reporting, and data management technologies with different data management and analysis approaches.

BI software is only one component of a business intelligence infrastructure. Business intelligence data is often kept in a data warehouse created for the entire company or in smaller data warehouses, which frequently have connections to an enterprise data warehouse and hold chunks of business information for specific departments and business units. Furthermore, Hadoop-based data lakes and other big data platforms are being employed as stores or landing pads for BI and analytics data, particularly for log files, sensor data, text, and other kinds of unstructured or semistructured data.

## 3.2 Business Intelligence Tools

### 3.2.1 Datapine

BI software called Datapine enables us to integrate our data from many sources and evaluate it using sophisticated capabilities (including artificial intelligence and predictive analytics). Using this application, we may create an effective business dashboard (or numerous), generate regular or customized reports, and include smart alerts to be warned of anomalies and goals. Datapine is an effective tool for businesses of all sizes because it can be used for a variety of industries, purposes, and platforms regardless of size, earning it great ratings of 4.8 stars on Capterra and 4.6 on G2Crowd.

**Features:**

- Without the need for complex coding or assistance from the IT team, we can just drag our KPIs into the interface and see how our graphs and charts are transformed into a sophisticated dashboard.
- We can choose the KPI and the number of data points we want to forecast using advanced analytics tools, such as predictive analysis based on a forecast engine.
- Advanced dashboard software capabilities like drill-downs, chart zooms, widgets linking, and hierarchy filters allow us to explore each component of the dashboard in great detail.
- By sharing via a password-protected live URL, allowing viewer access, or automating the distribution of an email report at predetermined intervals, we can build standard or customized reports.

### 3.2.2 SAP Business Objects

A business intelligence platform called SAP BusinessObjects is made for in-depth reporting, analysis, and data visualization. They offer PowerPoint and Excel connections with Office so that we may build interactive presentations and integrate hybrid analytics to their on-premises and cloud SAP systems. Business categories including CRM and customer experience, ERP and digital core, HR and employee engagement, digital supply chain, and many more are their main areas of concentration. In actuality, SAP is one of the biggest software providers in the world, with more than 170M consumers relying on it. The business received a rating of 4.3 stars on Capterra and 3.8 stars with over 200 reviews on G2Crowd, indicating its well-established position in the industry since 1972.

**Features:**

- The self-service features of analytics applications and data visualization are emphasized, allowing us to create our own role-based dashboards and applications to evaluate risks.
- To share our findings with other stakeholders and partners, we can develop a cross-enterprise sharing functionality.
- When we connect with SAP Business Information Warehouse, multidimensional data analysis allows us to filter and change data using real-time analytics.
- We can analyze bigger volumes of data using SAP with Microsoft Excel, and we can incorporate analytics in PowerPoint, which makes this solution simple to integrate with Office.

### 3.2.3 SAS Business Intelligence

For data analysts, text analysts, data engineers, forecast analysts, and other BI professionals, SAS Business Intelligence is a tool that offers a wide range of products and technology. From its founding in the 1970s, SAS Business Intelligence has built and expanded its product line continuously.

Although powerful predictive analytics are SAS' most well-known product, it also offers a fantastic business intelligence platform. High-level data integration and cutting-edge analytics & reporting are ensured by SAS. To provide us with extra contextual insights into our data, they also have a fantastic text analytics option. This product has a respectable level of user happiness and trust, receiving ratings of 4.2 on G2Crowd and 4.3 on Capterra.

**Features:**

- For visual data exploration, interactive reporting and dashboards, and mobile apps, SAS provides a variety of BI solutions and technologies.
- The automated analysis powered by machine learning given by SAS' data exploration is packaged in interactive visualizations that address business queries like "Where do my customers coming from?"
- Significant characteristics include location analytics, which integrates data in a geographical context, and text analytics, which allows us to derive insights from text data, such as social media.
- Our results can be viewed directly in the Microsoft Office Suite by integrating SAS with Microsoft Office programs like PowerPoint, Word, SharePoint, or Excel using their Office Analytics solution.

### 3.2.4 Pentaho

Hitachi Vantara's Pentaho is a complete data integration and analytics platform. OLAP services, reporting, dashboarding, data mining, integration, and other business intelligence features are all available through this. The software's goal is to assist businesses in managing large amounts of data such that it can have a beneficial impact on strategic choices and financial performance. Some of these functions are offered as open-sourced plugins. The BA platform from Pentaho is available in two configurations and may be utilized either on-premises or in the cloud. An enterprise edition that offers additional functionality and is available through a yearly subscription, or a community edition with more basic capabilities. Pentaho received ratings of 4.1 on G2Crowd and 4.3 in Capterra from reviewers, placing it in our ranking of BI tools.

**Features:**

- We can carry out data integration tasks and transformations both inside and outside of big data settings due to a powerful ETL engine.
- We demonstrate effective clustering, decision trees, and neural network data mining tasks utilizing a collection of machine learning techniques from the Weka project.
- A drag-and-drop interface for creating dashboards and scorecards with different data visualization possibilities.
- You should be able to quickly and easily analyze significant KPIs to provide answers to several business questions with only a few clicks.
- We will be able to quickly find the answers to numerous business questions by analyzing essential KPIs.

### 3.2.5 Domo

The Domo Appstore offers both pre-built and custom apps that may be used to extend data. Domo is a business intelligence program that consists of several systems that are incorporated in this platform, starting with linking the data. Together with Python scripts, we may use Domo for data lakes, warehouses, and ETL tools to prepare data for predictive modeling. Similar to other technologies, we may use their machine learning and artificial intelligence skills to integrate the data throughout our company and provide users the freedom to independently explore the data. This BI application has a solid 4.2 Capterra stars rating and an even higher 4.4 G2Crowd stars rating, and it is also highly recommended by many users worldwide.

**Features:**

- With Domo Workbench, we can connect to more than 1000 pre-built cloud connections locally.
- We won't need to learn SQL since data transformation technologies will allow us to prepare our data with a drag-and-drop Magic ETL, as Domo calls it.
- When uploading our data source to Domo, the visualization kinds that are automatically suggested allow us to move from raw data to charts, graphs, maps, and other visualization types.
- Mr. Roboto, the AI engine built into Domo, powers predictive analysis and gives data scientists access to Artificial Intelligence (AI) tools including machine learning, natural language processing, and alerting systems for KPI changes.

### 3.2.6 Oracle Business Intelligence

With a focus on offering end-to-end solutions, Oracle Business Intelligence is a portfolio of software and technologies. With the help of this BI solution, businesses may improve performance and equip themselves to take quicker, more informed decisions when using mobile devices. The extensive range of data management tools offered by Oracle Business Intelligence include machine learning, artificial intelligence, an integrated set of querying, reporting, and mobile analytics. Oracle has a rating of 4.0 in G2Crowd and 4.1 in Capterra.

**Features:**

- Using the Oracle BI Server tool, anyone across the organization can have centralized access to data.
- All data-driven business operations, including dashboards, ad hoc querying, OLAP analysis, data mining, and others, are hosted on the server.
- According to a person's roles and identities, Oracle BI Dashboards gives customized dashboards that offer interactive access to information.
- With the use of dashboards, emails, or even mobile devices, Oracle BI Delivers is a customized warning system that gives enterprises the ability to monitor activity.
- With the help of the Oracle BI Publisher capability, complicated information may be safely and correctly formatted delivered to stakeholders. These reports can be created in Microsoft Word or Adobe Acrobat and transmitted by email, printer, fax, WebDAV, or by being published on a portal. They can also be delivered online.

### 3.2.7 Zoho Analytics

Despite the fact that the company offers a wide range of products, including CRM, packages, and apps, this series focuses on their BI and analytics solutions. For in-depth reporting and data analysis, Zoho Analytics is an excellent BI solution. Automatic data syncing and recurring scheduling are features of this business intelligence solution. The integration APIs allow us to create connectors quickly and efficiently. We may build individualized reports and dashboards that allow us to zoom in on the crucial data using a simple editor. This business intelligence reporting tool has more than 500 business app integrations, more than 10,000 clients globally, a strong rating of 4.3 stars on Capterra, and a rating of 4.2 on G2Crowd.

**Features:**

- The main functions of this application center on combining data from many sources and showing it through reports and dashboards using a drag-and-drop builder.
- The Zoho DataPrep app in Zoho Analytics can be used for intelligent and automatic data preparation. For a more effective analysis process, data can be cleansed, converted, enriched, and cataloged.
- Zia is an intelligent assistant that Zoho has developed. We may ask queries Zia in normal language, and she will respond right away with reports and KPI widgets.
- For items like charts, pivot views, tabular views, or dashboards, we can enable real-time comments. Our collaborators will be alerted and we may create a comprehensive thread, attach files, and use other formatting options.
- Geo-visualization is a feature that will enable us to evaluate the geographical data using interactive map charts across countries, states, regions, and even latitudes and longitudes, in addition to other visualization options including charts, widgets, pivot tables, and tabular view features.

### 3.2.8 QlikSense

QlikSense is a Qlik product that combines a full data analytics platform with a business intelligence tool. QlikSense is accessible at all times and on any device. QlikSense is a very well-liked BI solution because its touchscreen-optimized user interface. The tool provides a variety of enhanced analytics features, including data visualizations, dashboards, reporting, natural language processing, and more. The purpose of this tool is to enable users of all levels of expertise to use data to make insightful decisions. Users seem to be happy with this product and its capabilities, as evidenced by its good ratings of 4.4 stars on Capterra and 4.5 stars on G2Crowd.

**Features:**

- The associative exploration feature allows users to enter basic selection and search criteria to find relationships between different data sets.
- No matter the quantity of the data, self-service data visualization makes it simple to combine, load, visualize, and explore them.
- Natural Language Processing (NLP) allows us to communicate with the Insight Adviser in Qlik Sense and ask it questions about analysis and discovery.
- To provide precise answers, Qlik Sense Apps are developed on the cloud hub of the company. The apps have one or more sheets of significant data that are visualized and evaluated.
- The flexibility to expand Qlik Sense with additional products from Qlik's range allows customers to create unique dual-use strategies.

| BI SOFTWARE PROVIDER | | HEADQUARTERS | CAPTERRA RATING | G2CROWD RATING |
|---|---|---|---|---|
| datapine | datapine | Berlin, Berlin, Germany | 4.8 ★★★★★ | 4.6 ★★★★½ |
| sas | SAS Business Intelligence | Cary, North Carolina, USA | 4.3 ★★★★½ | 4.2 ★★★★☆ |
| Infor Birst | Infor Birst | New York, New York, USA | 4.1 ★★★★☆ | 3.9 ★★★★☆ |
| SAP | SAP BusinessObjects | Walldorf, BW, Germany | 4.3 ★★★★☆ | 3.8 ★★★★☆ |
| pentaho | Pentaho | Santa Clara, California, USA | 4.3 ★★★★½ | 4.1 ★★★★☆ |
| DOMO | Domo | American Fork, Utah, USA | 4.2 ★★★★☆ | 4.4 ★★★★½ |
| ORACLE | Oracle BI | Austin, Texas, USA | 4.1 ★★★★☆ | 4.0 ★★★★☆ |
| InetSoft | Style Intelligence | Piscataway, New Jersey, USA | 4.5 ★★★★½ | 4.5 ★★★★½ |
| Zoho Analytics | Zoho Analytics | Chennai, Tamil, Nadu, India | 4.3 ★★★★½ | 4.2 ★★★★☆ |
| Dundas BI | Dundas BI | Raleigh, North Carolina, USA | 4.5 ★★★★½ | 4.4 ★★★★½ |
| GoodData | GoodData | San Francisco, California, USA | 4,3 ★★★★½ | 4,1 ★★★★☆ |
| IBM Cognos | IBM Cognos | Armonk, New York, USA | 4.1 ★★★★☆ | 3.9 ★★★★☆ |
| Metabase | Metabase | San Francisco, California, USA | 4.5 ★★★★½ | 4.4 ★★★★½ |
| Qlik | Qlik Sense | King of Prussia, Pennsylvania, USA | 4.4 ★★★★½ | 4.5 ★★★★½ |
| board | Board | Chiasso, Ticino, Switzerland | 4.5 ★★★★½ | 4.4 ★★★★½ |

*Capterrra and G2Crowd rankings from 11/2022

*Figure 3. 1 List of the top BI tools for 2023, along with user reviews*

**Creating a business intelligence tool, application, or user interface that is capable of carrying out a certain task to assist with advanced problem-solving and decision-making.**

## 3.3 Initial Design of Yard of Ale Machines and Equipment Managerial Dashboard

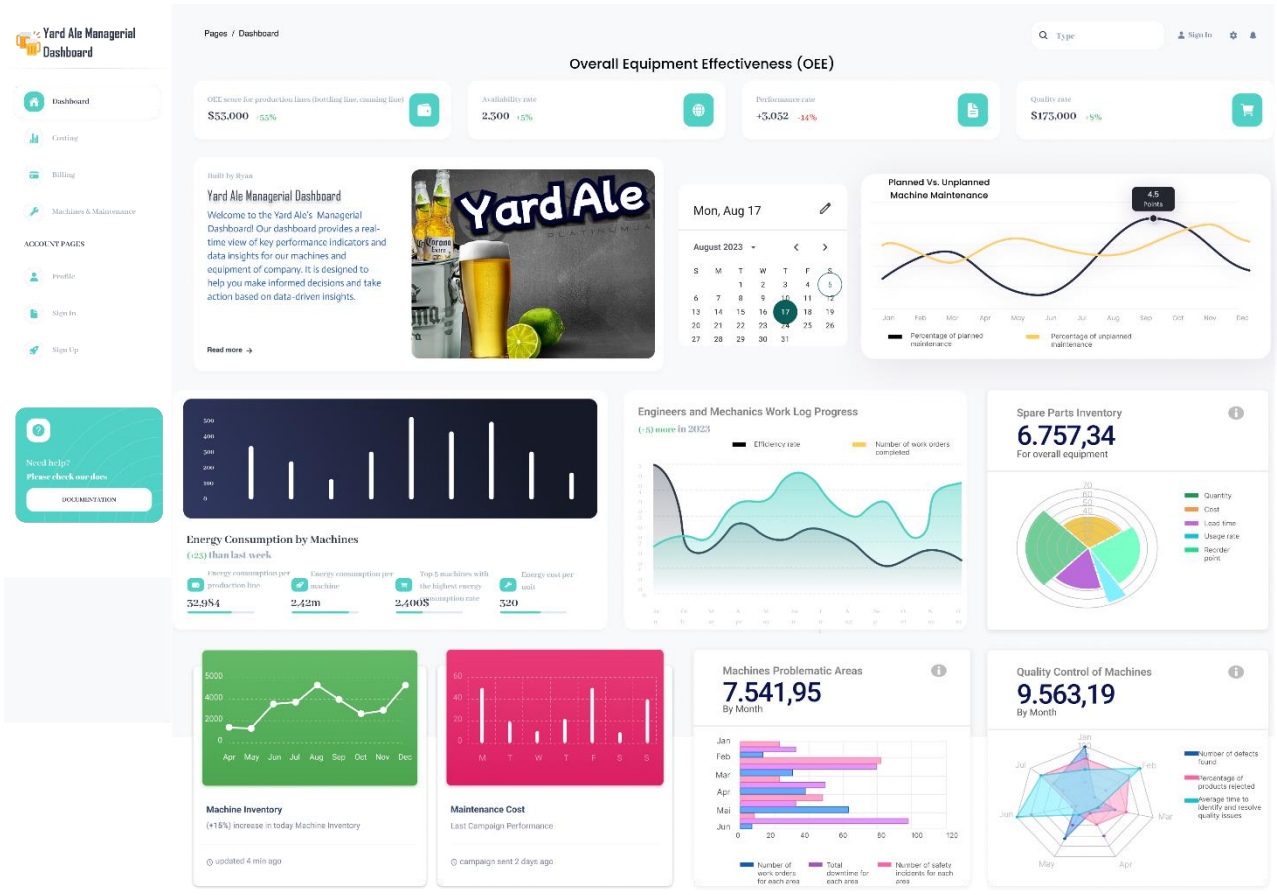



*Figure 3. 2 Initial Design of Yard of Ale Machines and Equipment Managerial Dashboard*

# Customizing the above design to make it more user-friendly and functional

## 3.4 Final Design of Yard of Ale Machines and Equipment Managerial Dashboard

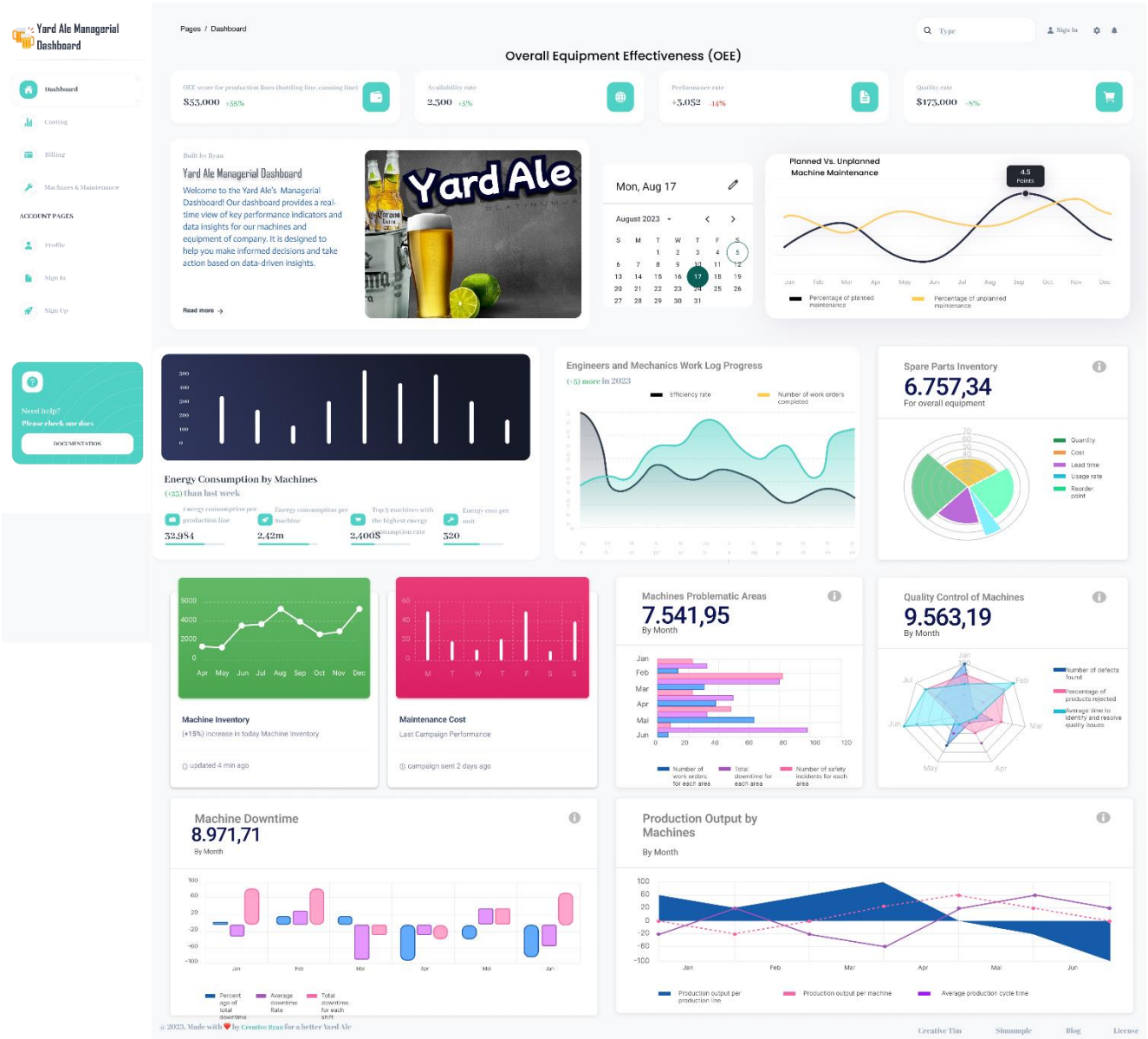



*Figure 3. 3 Final Design of Yard of Ale Machines and Equipment Managerial Dashboard*

I've added two additional components to the initial design: Machine Downtime and Machine Production Output. These changes are significant because they offer valuable data about the effectiveness and productivity of the manufacturing process.

Machine Downtime is the period during which a machine is not in use as a result of unanticipated circumstances like malfunctions, maintenance, or repair. We can find places where changes can be made to cut downtime and boost production efficiency by keeping track of machine downtime. In order to prevent further downtime, this data can also be used to predict potential issues and arrange for preventative maintenance.

The number of products each machine produces is referred to as its production output. This information can be used to determine which machines are the most productive and which ones may need to be replaced or upgraded. By allocating resources and planning production depending on each machine's output capability, it can also assist in increasing efficiency.

It is important to understand the relationship between machine downtime and production output because any downtime affects output. For instance, if a machine requires extensive maintenance, the output of the production will be impacted negatively. Combining the two data allows us to spot the machines with the highest downtime and lowest production output and take the necessary action to improve their performance.

In conclusion, it is crucial to include Machine Downtime and Production Output by Machines in the initial design in order to track the effectiveness and productivity of your manufacturing process, improve machine performance, cut down on downtime, and boost production.

# Analyzing the design critically in terms of how it satisfies a particular user or business demand and identify any customization that has been made.

## 3.5 Critical Review of the Yard of Ale Machines and Equipment Managerial Design

Yard of Ale Beverage Company's Chief Engineer's Business Intelligence Dashboard appears to be a comprehensive and effective tool for monitoring and managing many areas of the company's production process. The dashboard offers a comprehensive view of the business' operations by providing real-time and historical data on critical performance metrics like Overall Equipment Effectiveness, Planned vs. Unplanned Maintenance, Spare Parts Inventory, Work Log Progress, Energy Consumption, Quality Control, Machine Problematic Areas, and Machine Downtime. This allows the Chief Engineer to spot areas of strength and weakness and take proactive steps to improve performance.

The dashboard offers useful information on Planned vs. Unplanned Maintenance, Work Log Progress, Quality Control, and Machine Problematic Areas when it comes to monitoring machinery maintenance and repair. The Chief Engineer can track the progress and effectiveness of maintenance and repair work by keeping an eye on these metrics, which also allow him to identify machinery that needs upkeep or repair. The Spare Parts Inventory widget also enables the Chief Engineer to keep a healthy stock of spare parts, ensuring that essential components are available when required and minimizing production bottlenecks.

The Machine Downtime widget on the dashboard gives real-time information on system downtime, enabling the Chief Engineer to immediately spot and address problems that could result in production delays or disruptions. The Chief Engineer can also track energy

use with the help of the Energy Consumption widget, which helps him or her to spot possibilities to do so and cut down on operational costs and promote sustainability.

Overall, the Chief Engineer's Business Intelligence Dashboard design for Yard of Ale Beverage Company offers a thorough and practical tool for managing all facets of the business's manufacturing process. The dashboard helps the Chief Engineer to make educated decisions, prioritize tasks, and take preventative measures to increase performance while avoiding production disruptions by giving real-time and historical data on important performance parameters.

### 3.5.1 Overall Equipment Effectiveness (OEE)

OEE, or overall equipment effectiveness, measures how efficiently production equipment is used. The availability rate, performance rate, and quality rate are the three variables that are considered. These three rates are multiplied together to determine the OEE score.

- The availability rate: The percentage of time that the equipment is available for use in production is measured by the availability rate. This takes into consideration any unanticipated downtime brought on by malfunctions, upgrades, and other circumstances.
- The performance rate: The percentage of the equipment's maximal speed that is actually used for production is measured by the performance rate. This considers elements including setup time, maintenance, and operator productivity.
- The quality rate: The percentage of products that adhere to the necessary quality criteria is measured by the quality rate. Defects, scrap, and rework are considered in this.

The OEE score gives a thorough overview of Yard Ale Beverage Company how successfully manufacturing equipment is being used and where improvements can be made by combining these three elements.

### 3.5.2 Planned vs. Unplanned Machine Maintenance

This measures how frequently equipment maintenance is carried out in Yard Ale Beverage Company. Both scheduled and unscheduled maintenance are taken into consideration.

- Percentage of planned maintenance: The amount of maintenance that is scheduled in advance is represented by the planned maintenance percentage. This covers regular inspections, preventive maintenance, and other organized tasks.
- Percentage of unplanned maintenance: The percentage of maintenance actions that are unplanned or unexpected is measured by the percentage of unscheduled maintenance. Breakdowns, urgent repairs, and other unanticipated incidents fall under this category.

Yard Ale Beverage Company can evaluate the success of their maintenance programs and make any necessary improvements by monitoring these two KPIs. While lowering the percentage of unscheduled maintenance can lower repair costs and boost overall equipment effectiveness, increasing the percentage of planned maintenance can decrease downtime and boost equipment reliability.

### 3.5.3 Spare Parts Inventory

The quantity, cost, and availability of spare parts that are kept on hand for equipment upkeep and repairs are measured by the spare parts inventory. It considers a number of significant elements, such as:

- Quantity: The total amount of spare parts that are currently on hand is indicated.
- Cost: This provides the entire cost of the spare parts in stock, which includes the cost of the purchase as well as any related handling and storage fees.
- Lead time: This indicates how long it takes to get a spare part after ordering it.
- Usage rate: This information reveals how frequently spare components are used for upkeep and repairs.

- Reorder point: This indicates the time when fresh spare parts are ordered to refill the inventory, usually in accordance with a predetermined minimum quantity or a criticality level.

Yard Ale Beverage Company may reduce lead times and inventory costs while also ensuring they have the necessary spare parts on hand when needed by keeping track of these aspects. Achieving the ideal inventory level can increase machine efficiency while lowering maintenance costs and downtime.

### 3.5.4 Engineers and Mechanics Work Log Progress

Yard Ale Beverage Company's Engineers' and mechanics' productivity and efficiency in performing maintenance and repairs are measured by the work log progress. It considers two important metrics:

- Efficiency rate: This information reveals the percentage of work orders that are finished within the budgeted time and cost constraints. This considers elements including resource availability, labor productivity, and task scheduling.
- Number of work orders completed: This provides the total number of work orders that were finished in a specific amount of time. This gives an indication of how productive maintenance and repair work has been overall.

Yard Ale Beverage Company can evaluate the success of their maintenance programs and spot areas for development by monitoring these measures. While increasing the number of maintenance orders executed can boost equipment dependability and overall equipment effectiveness, improving efficiency rates can lower costs and downtime.

### 3.5.5 Energy Consumption by Machines

Energy Consumption by Machines is a measurement of the energy consumption of manufacturing machinery. It considers a number of crucial metrics, including:

- Energy consumption per production line: This provides the overall energy consumption of all the equipment on a specific manufacturing line, which is commonly measured in kilowatt-hours (kWh) or other units.
- Energy consumption per machine: This provides the average energy consumption of each particular machine, which is often measured in kWh or another unit.
- Top 5 machines with the highest energy consumption rate: This information provides the average energy consumption of the top 5 machines, often measured in kWh or another unit.
- Energy cost per unit: This information provides the cost of the energy used by each machine or assembly line, which is often measured in dollars per kWh or other units.

Yard Ale Beverage Company can find ways to lower energy expenses and usage by monitoring these data, which will help increase the overall efficiency of their equipment. Lowering energy use per machine or per production line can save costs and have a positive influence on the environment. By identifying the machines that use the most energy, energy reduction efforts can be concentrated where they will have the most effects.

### 3.5.6 Quality Control of Machines

The dependability and quality of production machinery are evaluated through quality control of machines. It considers a number of crucial metrics, including:

- Number of defects found: This provides the overall amount of flaws or difficulties with quality found during the production process, usually calculated per production unit or per machine.
- Percentage of products rejected: Often expressed as a percentage of total production, this information reveals the proportion of products that are either rejected during the production process or do not fulfill quality standards.

- Average time to identify and resolve quality issues: This information reveals the typical time it takes to find and fix quality problems, from the moment they are first noticed until they are entirely fixed.

By monitoring these data, Yard Ale Beverage Company can make sure that their production machinery is performing at its best and upholding quality requirements. While lowering the average time to discover and address quality concerns can assist limit downtime and production delays, it can also help enhance overall equipment effectiveness and decrease waste by lowering the number of defects found and the percentage of products that are rejected.

### 3.5.7 Machines Problematic Areas

Machines Problematic Areas is a metric used to assess the dependability and security of producing machinery. It considers a number of crucial metrics, including:

- Number of work orders for each area: In general, this is broken down by sector or sub-sector and provides the total number of work orders or maintenance requests for each area of the production plant.
- Total downtime for each area: This provides the total downtime that each part of the production plant has experienced, which is normally measured in minutes or hours.
- Number of safety incidents for each area: This provides an overall breakdown of the number of safety events or accidents that take place in each sector of the manufacturing facility, usually expressed as a rate per production unit or per machine.

Yard Ale Beverage Company can spot trouble spots in the production facility and take action to fix them by monitoring these indicators. An increase in work orders or maintenance requests for a certain location could mean that the equipment there is unreliable or needs to be maintained more frequently. Similar to excessive levels of downtime or safety incidents, greater equipment requirements or safety precautions may be necessary in a certain sector.

### 3.5.8 Machine Downtime

The amount of time that Yard Ale Beverage Company's production equipment is not in use is measured as machine downtime. It considers a number of crucial metrics, including:

- Percentage of total downtime: This information reveals the percentage of total production time that is lost as a result of equipment breakdowns, which is commonly expressed as a percentage of all production time.
- Average downtime rate: This provides the typical rate of equipment downtime, which is expressed as minutes or hours per unit of production or machine.
- Total downtime for each shift: This shows the total amount of downtime encountered throughout each production shift, usually expressed in minutes or hours.

Yard Ale Beverage Company can discover parts of their production process that have a lot of downtime by monitoring these indicators and take action to fix the problem. Increasing production efficiency and increasing overall equipment effectiveness can both be achieved by reducing downtime rates and total downtime. Monitoring equipment performance and downtime by shift can also reveal patterns or trends that can be used to guide maintenance and repair efforts.

### 3.5.8 Production Output by Machines

A measurement of the effectiveness and productivity of industrial machinery is called production output by machines (POM). It considers a number of crucial metrics, including:

- Production output per production line: This information provides the overall manufacturing output (in units) for each production line over a specified time frame, which is commonly expressed in hours, days, or weeks.

- Production output per machine: This provides the overall manufacturing output for each particular machine for a specified time period, which is commonly measured in hours, days, or weeks.
- Average production cycle time: This provides the typical length of time, usually expressed in minutes or hours, needed to complete a production cycle.

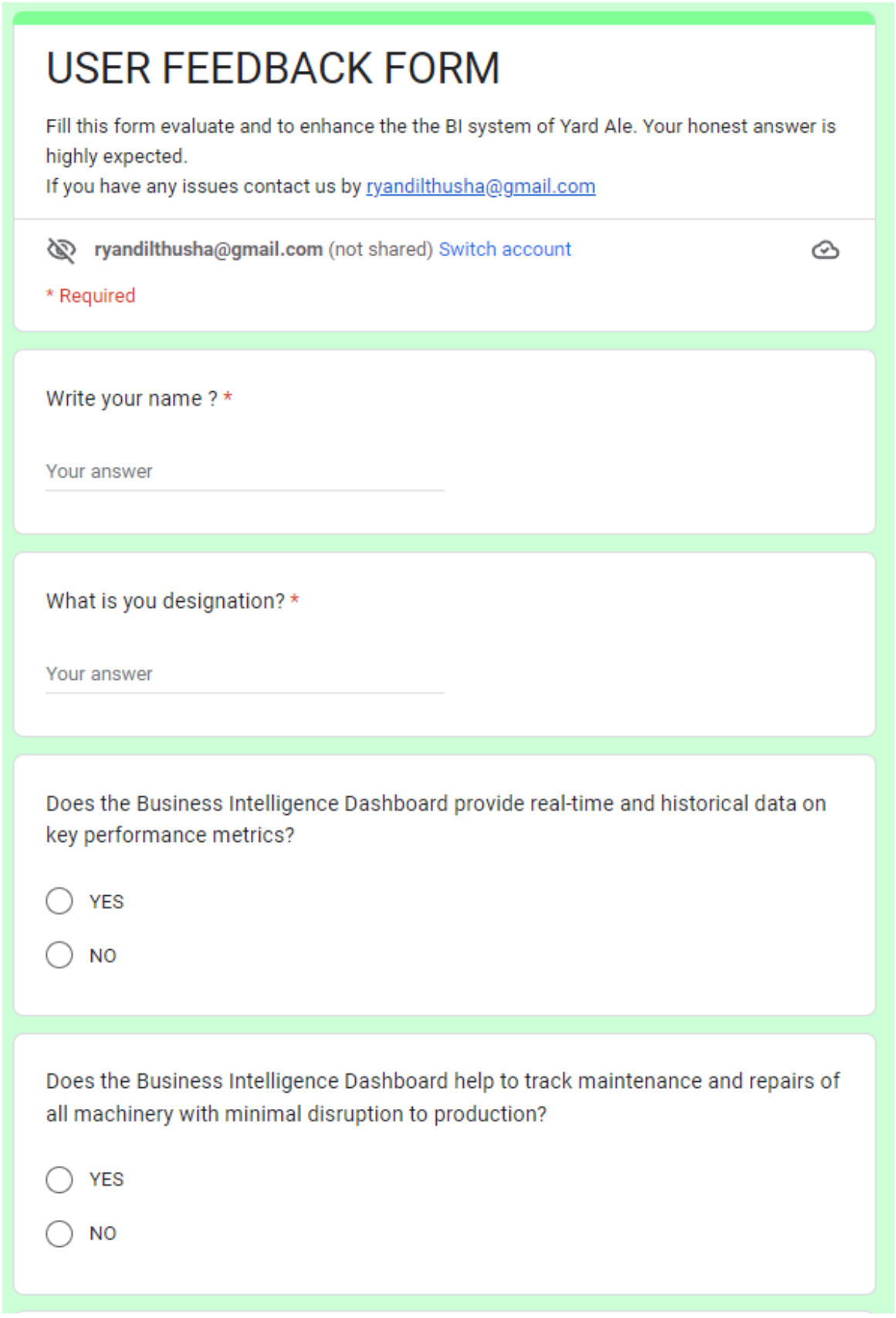
Yard Ale Beverage Company that analyze these indicators can pinpoint the parts of their manufacturing process that are operating at high levels of productivity and efficiency as well as those that may need improvement. In general, production efficiency can be increased by increasing output per machine or per production line, while production speed and responsiveness to market demand can be increased by decreasing the average production cycle time.

### 3.5.10 Machine Cost and Maintenance Cost

- Machine Cost: Data about the cost of operating and maintaining manufacturing equipment could be included in the Machine Cost section, along with visuals like line charts. The Yard Ale Beverage Company Chief Engineer would be able to monitor equipment expenses in this way and spot possibilities to optimize equipment utilization and repair schedules.
- Maintenance Cost: Data about the cost of maintaining manufacturing equipment could be included in the maintenance cost section together with visuals like bar charts. The Yard Ale Beverage Company Chief Engineer would then be able to spot patterns in maintenance expenditures and change maintenance plans or procedures as necessary.

The Yard Ale Beverage Company may manage equipment costs efficiently, reduce downtime, and optimize maintenance schedules by keeping an eye on these important variables. This can help guarantee that the company's production facilities are running effectively and affordably, which helps maximize revenues.

## 3.5 User Feedback Form for the above Design



USER FEEDBACK FORM

Fill this form evaluate and to enhance the the BI system of Yard Ale. Your honest answer is highly expected.
If you have any issues contact us by ryandilthusha@gmail.com

ryandilthusha@gmail.com (not shared) Switch account

* Required

Write your name ? *

Your answer

What is you designation? *

Your answer

Does the Business Intelligence Dashboard provide real-time and historical data on key performance metrics?

YES

NO

Does the Business Intelligence Dashboard help to track maintenance and repairs of all machinery with minimal disruption to production?

YES

NO

*Figure 3. 4 User Feedback Form for the above Design - pt 1*

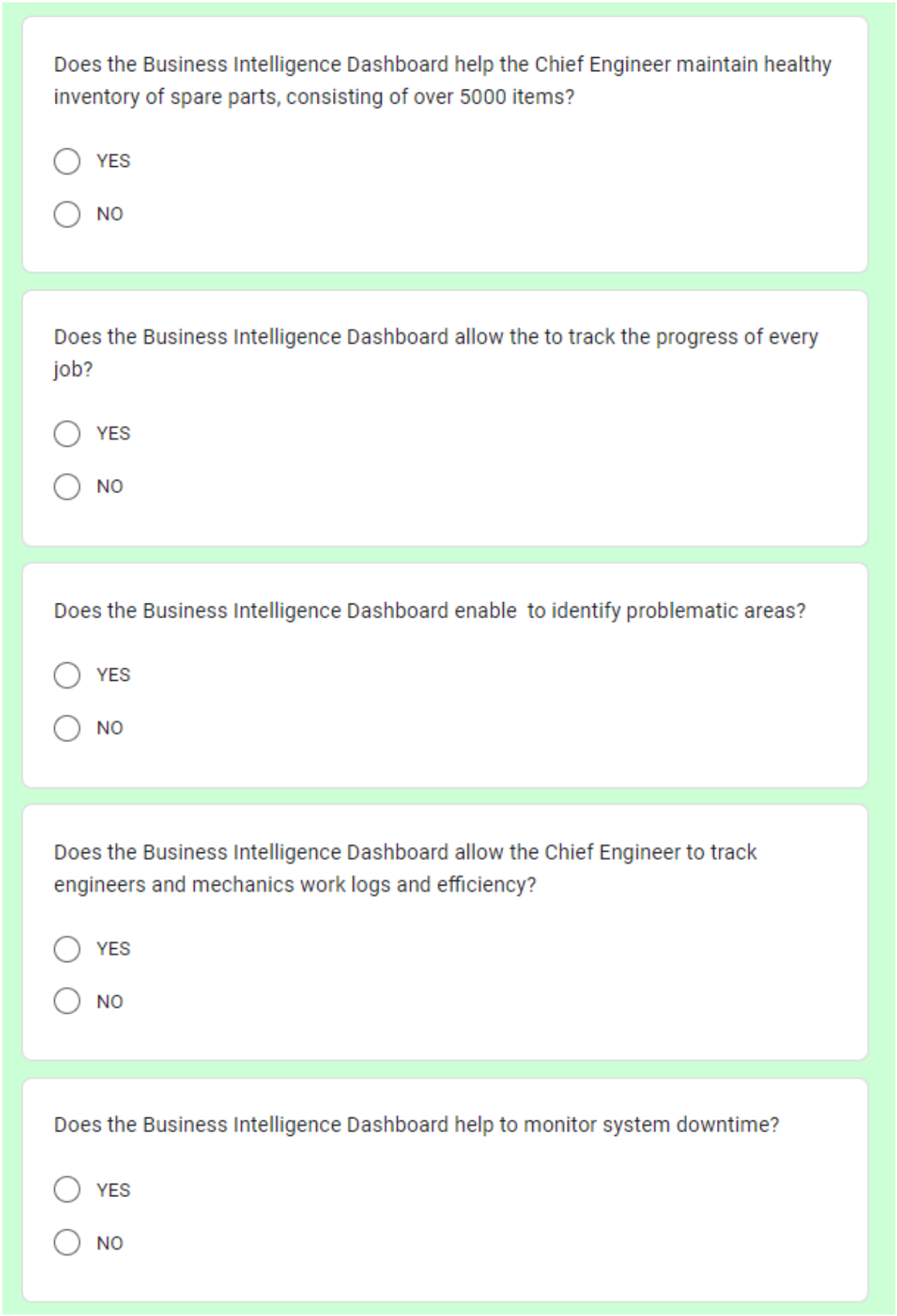



*Figure 3. 5 User Feedback Form for the above Design - pt 2*

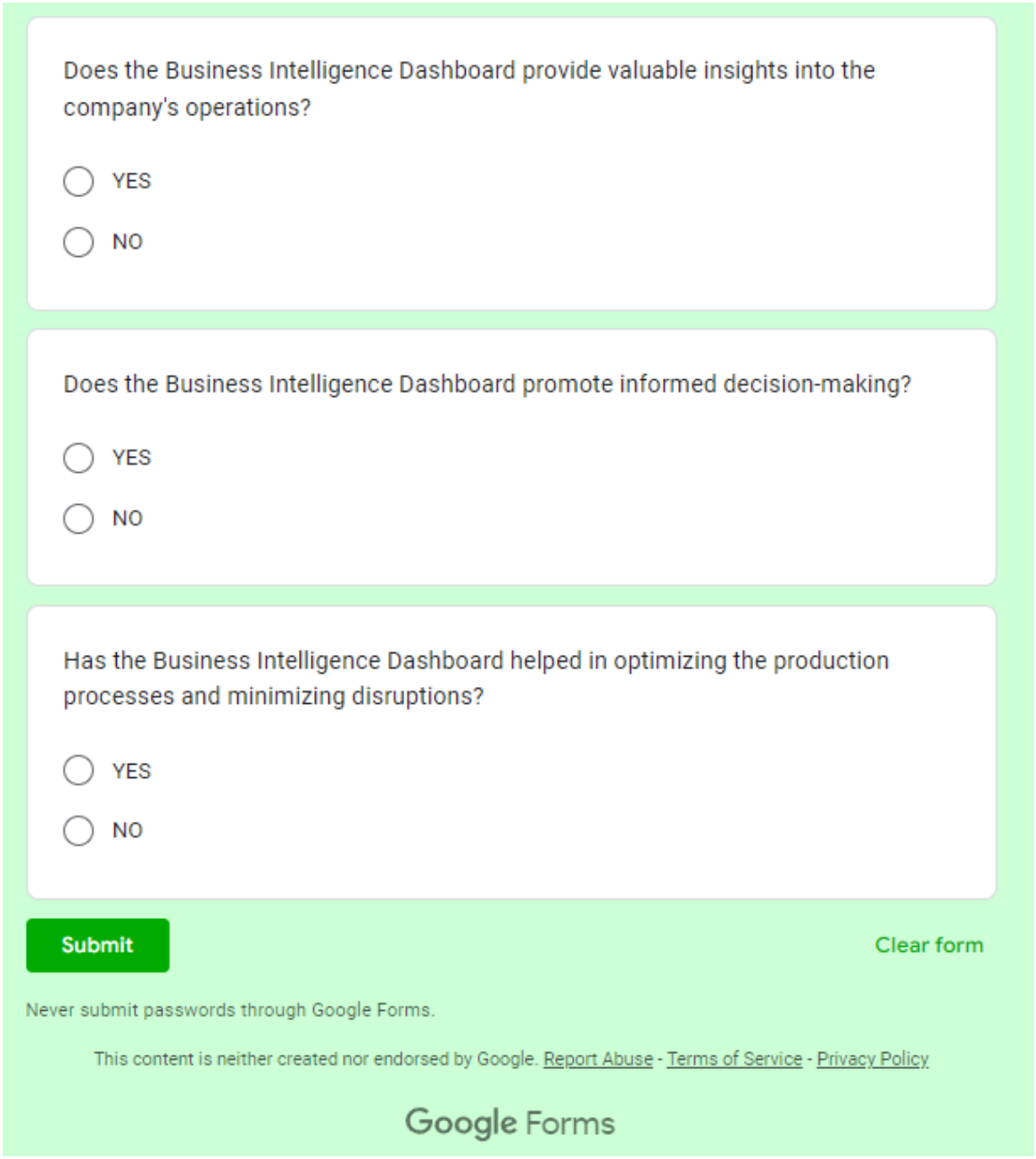



*Figure 3. 6 User Feedback Form for the above Design - pt 3*

## 3.6 Critically Evaluation Analysis for above Questionnaire

### Question 01 :

*Table 3. 1 Data collection table for Question 1*

| Does the Business Intelligence Dashboard provide real-time and historical data on key performance metrics? | |
|---|---|
| Answers | Number of answers |
| YES | 40 |
| NO | 10 |

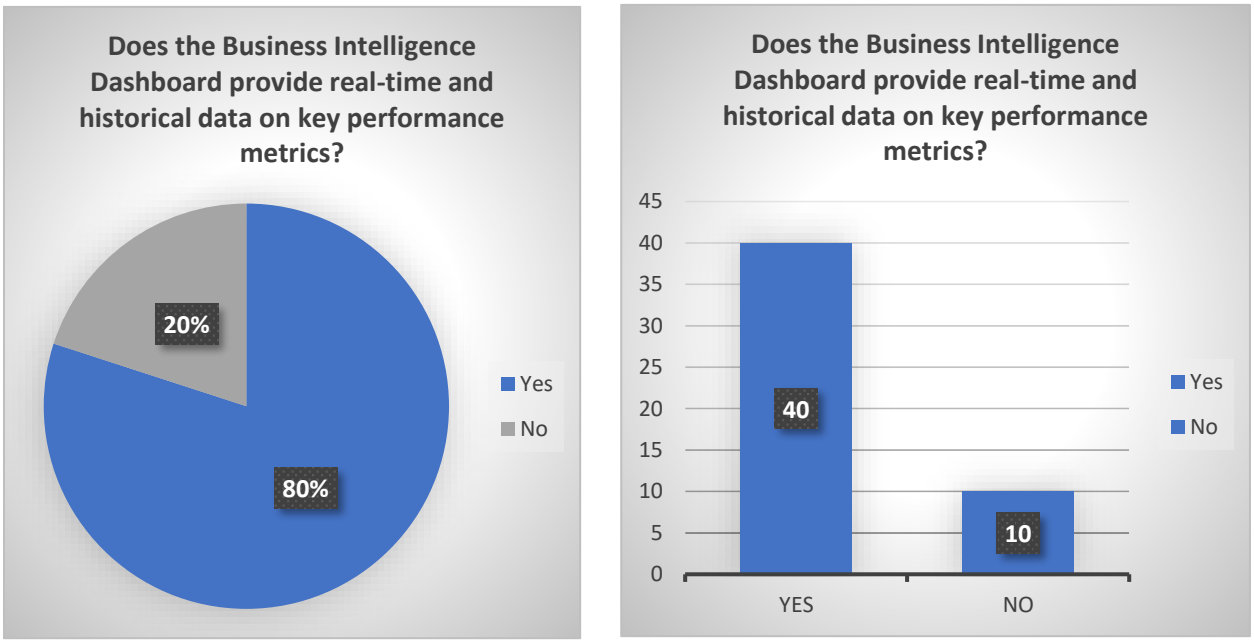



*Figure 3. 7 Visualize the collected data using Pie Chart and Column chart for Question 1*

### Data Analysis →

According to the data analysis results 80% proves this Business Intelligence Dashboard provide real-time and historical data on key performance metrics.

## Question 02 :

*Table 3. 2 Data collection table for Question 2*

| Does the Business Intelligence Dashboard help the Chief Engineer track maintenance and repairs of all machinery with minimal disruption to production? | |
|---|---|
| Answers | Number of answers |
| YES | 47 |
| NO | 3 |

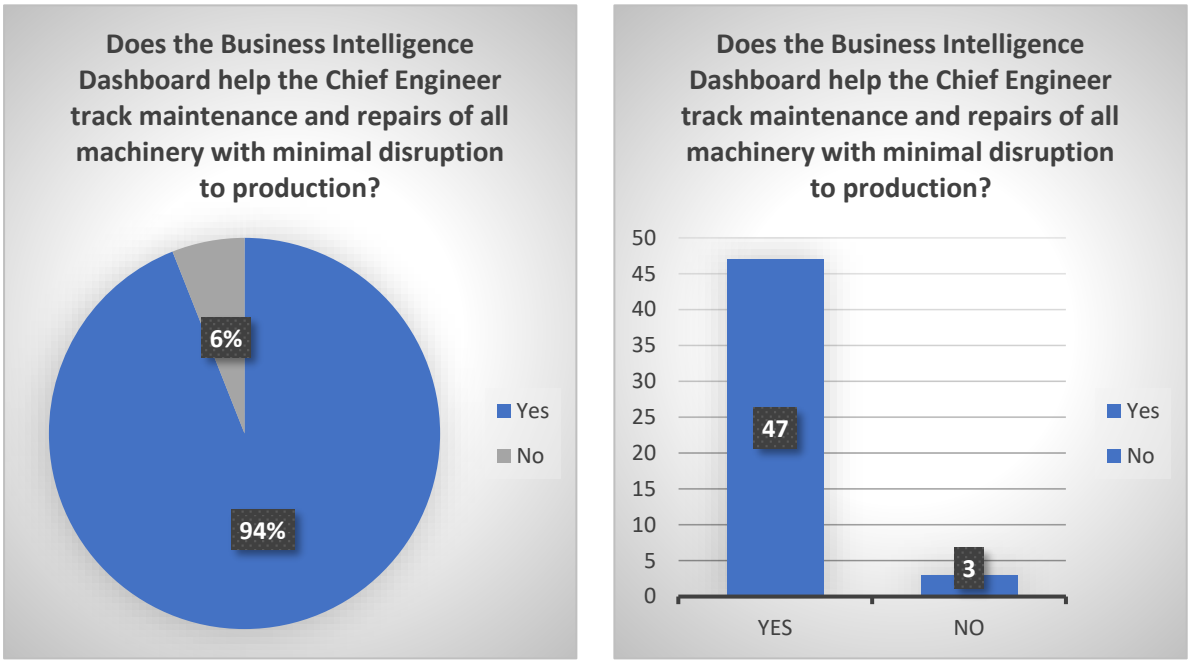



*Figure 3. 8 Visualize the collected data using Pie Chart and Column chart for Question 2*

### Data Analysis →

According to the data analysis results 94% proves this Business Intelligence Dashboard helps the Chief Engineer track maintenance and repairs of all machinery with minimal disruption to production.

## Question 03 :

*Table 3. 3 Data collection table for Question 3*

| Does the Business Intelligence Dashboard help the Chief Engineer maintain healthy inventory of spare parts, consisting of over 5000 items? | |
|---|---|
| Answers | Number of answers |
| YES | 45 |
| NO | 5 |

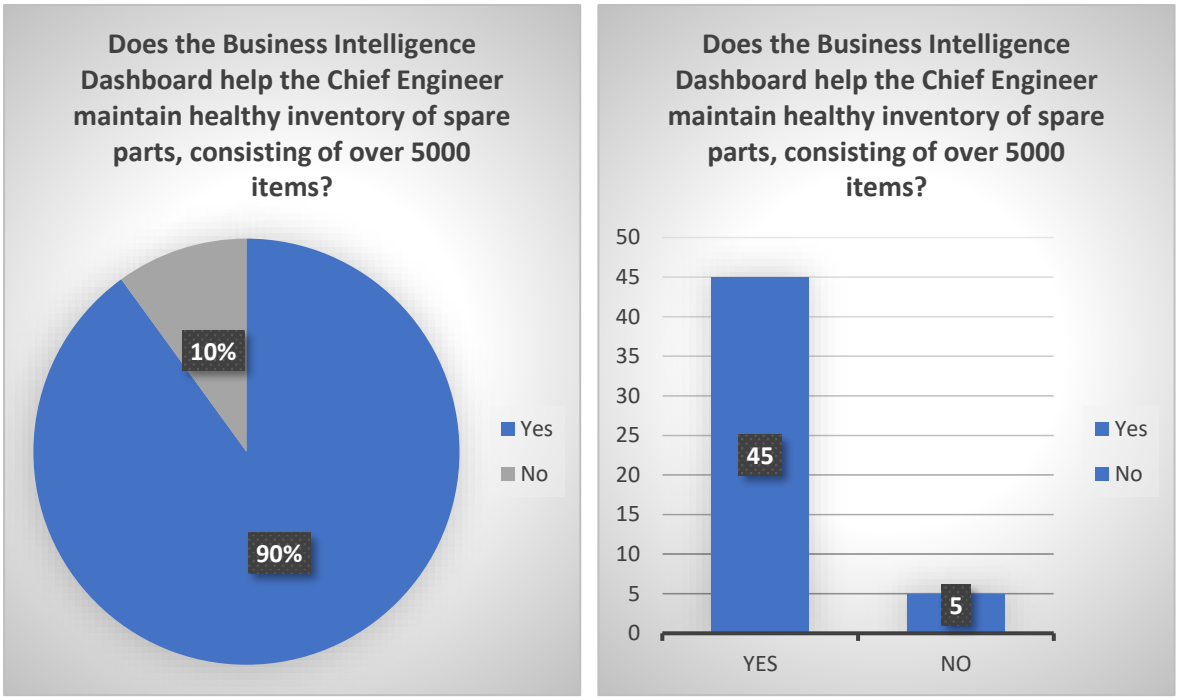



*Figure 3. 9 Visualize the collected data using Pie Chart and Column chart for Question 3*

### Data Analysis →

According to the data analysis results 90% proves this Business Intelligence Dashboard help the Chief Engineer and staff maintain healthy inventory of spare parts, consisting of over 5000 items.

## Question 04 :

*Table 3. 4 Data collection table for Question 4*

| Does the Business Intelligence Dashboard allow to track the progress of every job? | |
|---|---|
| Answers | Number of answers |
| YES | 50 |
| NO | 0 |

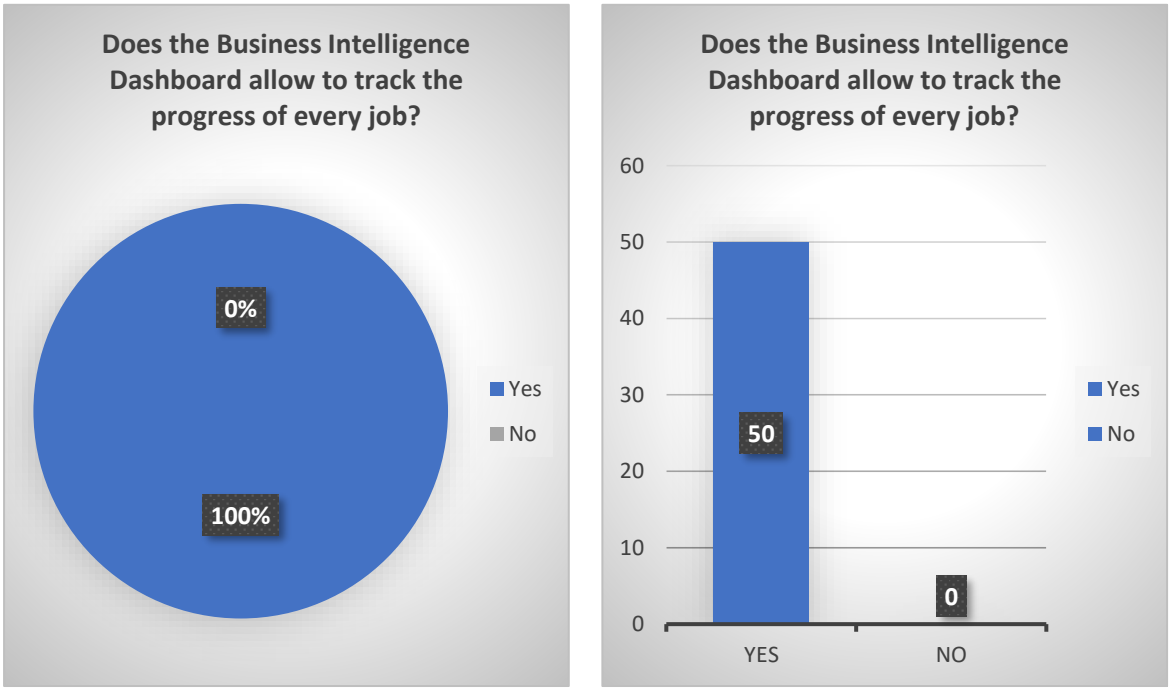



*Figure 3. 10 Visualize the collected data using Pie Chart and Column chart for Question 4*

**Data Analysis →**

According to the data analysis results 100% proves this Business Intelligence Dashboard allows the Chief Engineer and staff to track the progress of every job.

**Question 05 :**

*Table 3. 5 Data collection table for Question 5*

| Does the Business Intelligence Dashboard enable to identify problematic areas? | |
|---|---|
| Answers | Number of answers |
| YES | 26 |
| NO | 24 |

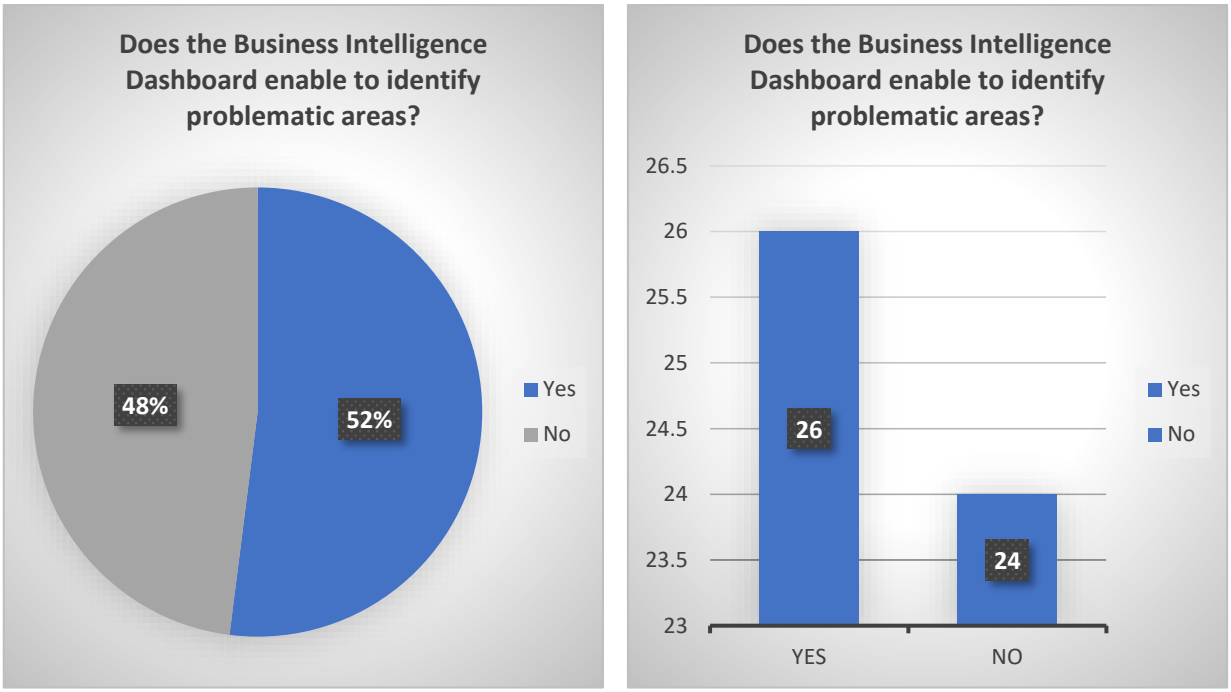



*Figure 3. 11 Visualize the collected data using Pie Chart and Column chart for Question 5*

**Data Analysis →**

According to the data analysis results 52% proves this Business Intelligence Dashboard enables to identify problematic areas.

## Question 06 :

*Table 3. 6 Data collection table for Question 6*

| Does the Business Intelligence Dashboard allow the Chief Engineer to track engineers and mechanics work logs and efficiency? | |
|---|---|
| Answers | Number of answers |
| YES | 40 |
| NO | 10 |

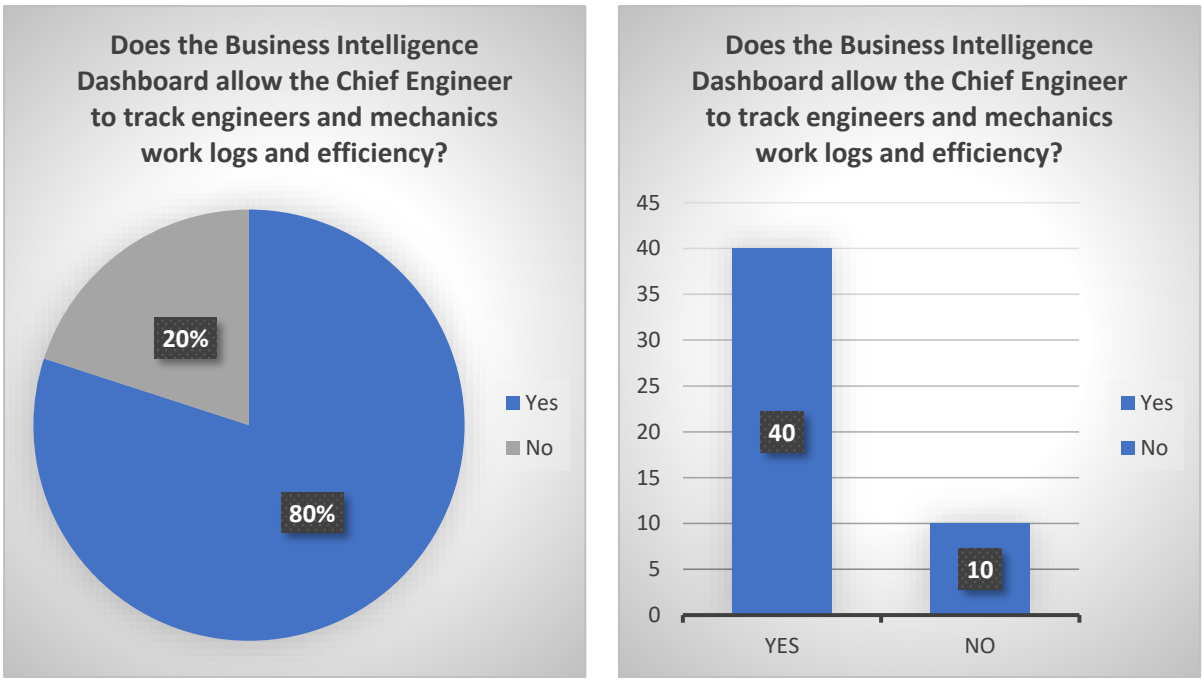



*Figure 3. 12 Visualize the collected data using Pie Chart and Column chart for Question 6*

### Data Analysis →

According to the data analysis results 80% prove this Business Intelligence Dashboard allows the Chief Engineer to track engineers and mechanics work logs and efficiency.

## Question 07 :

*Table 3. 7 Data collection table for Question 7*

| Does the Business Intelligence Dashboard help the Chief Engineer monitor system downtime? | |
|---|---|
| Answers | Number of answers |
| YES | 48 |
| NO | 06 |

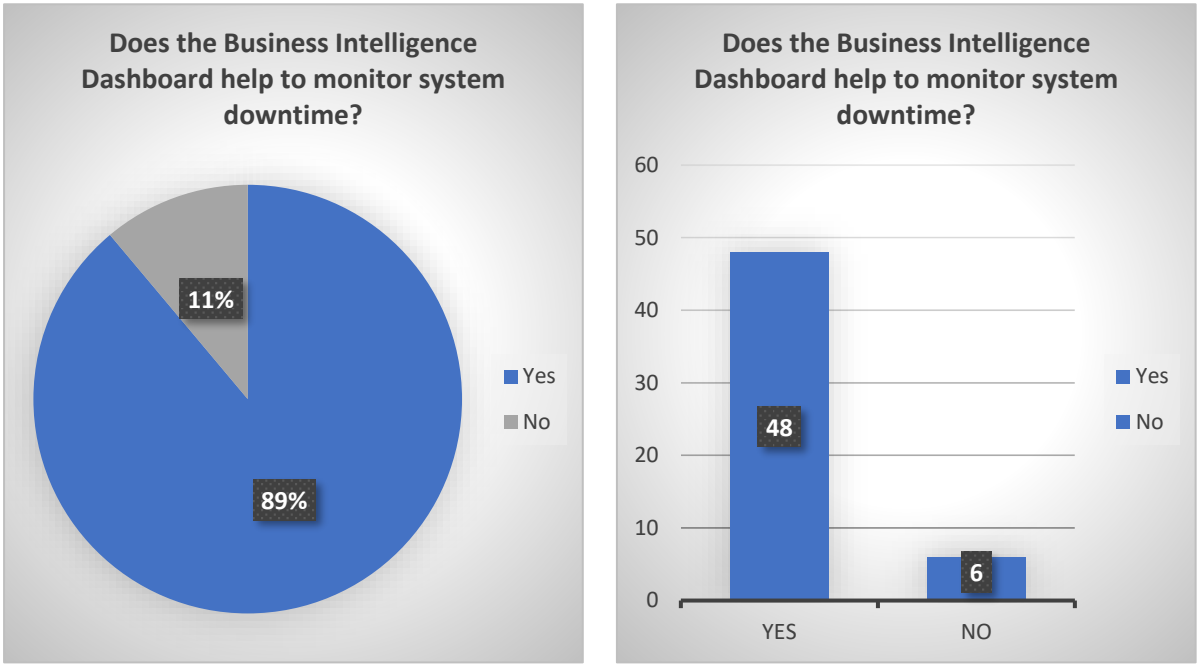



*Figure 3. 13 Visualize the collected data using Pie Chart and Column chart for Question 7*

**Data Analysis →**

According to the data analysis results 89% proves this Business Intelligence Dashboard help to monitor system downtime for the Chief Engineer and staff.

## Question 08 :

*Table 3. 8 Data collection table for Question 8*

| Does the Business Intelligence Dashboard provide valuable insights into the company's operations? | |
|---|---|
| Answers | Number of answers |
| YES | 45 |
| NO | 5 |

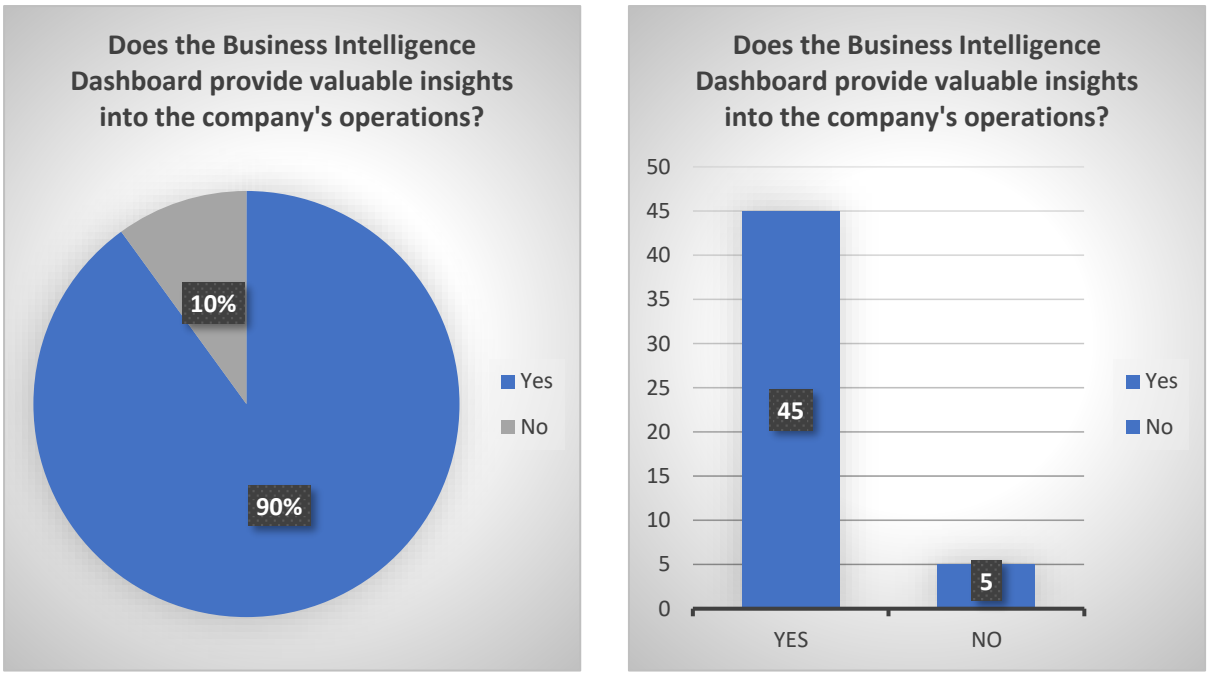



*Figure 3. 14 Visualize the collected data using Pie Chart and Column chart for Question 8*

**Data Analysis →**

According to the data analysis results 90% prove this Business Intelligence Dashboard provides valuable insights into the company's operations.

## Question 09 :

*Table 3. 9 Data collection table for Question 9*

| Does the Business Intelligence Dashboard promote informed decision-making? | |
|---|---|
| Answers | Number of answers |
| YES | 42 |
| NO | 8 |

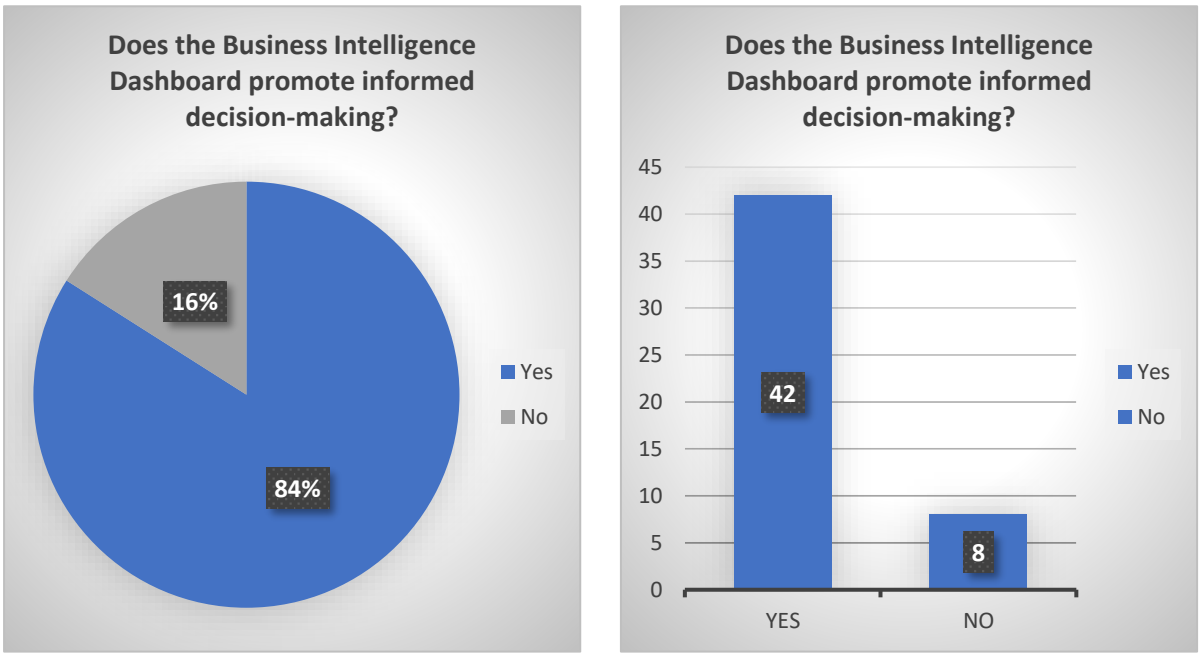



*Figure 3. 15 Visualize the collected data using Pie Chart and Column chart for Question 9*

**Data Analysis →**

According to the data analysis results 84% prove this Business Intelligence Dashboard promote informed decision-making.

## Question 10 :

*Table 3. 10 Data collection table for Question 10*

| Has the Business Intelligence Dashboard helped the Chief Engineer in optimizing the production processes and minimizing disruptions? | |
|---|---|
| Answers | Number of answers |
| YES | 49 |
| NO | 1 |

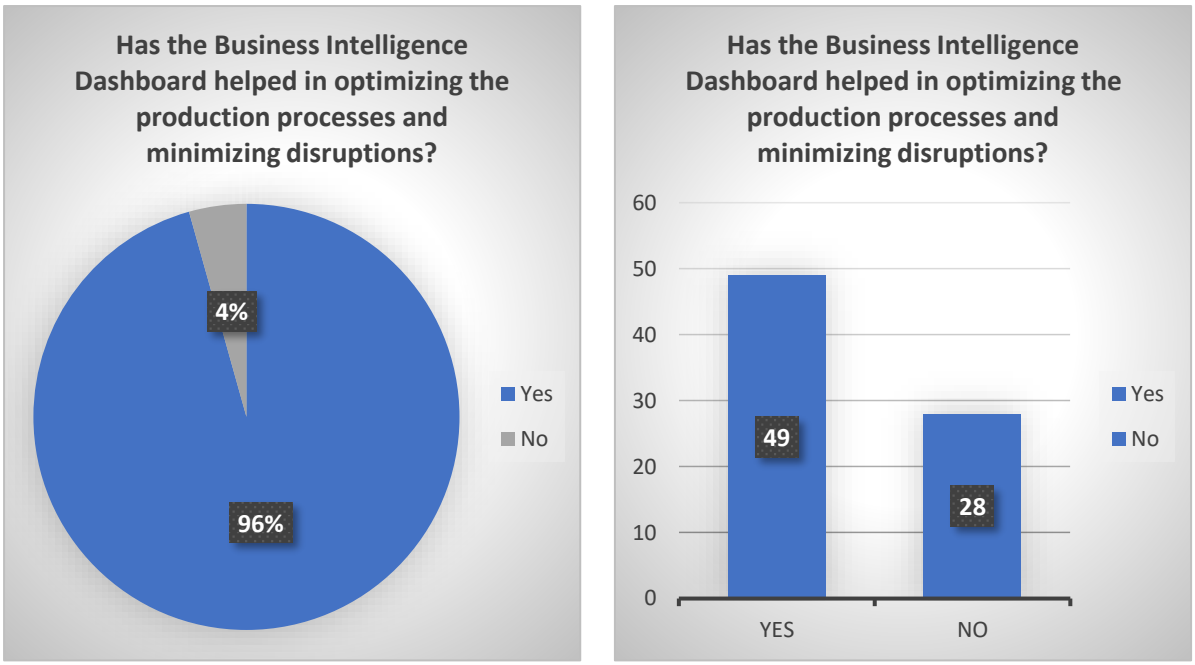



*Figure 3. 16 Visualize the collected data using Pie Chart and Column chart for Question 10*

**Data Analysis →**

According to the data analysis results 96% proves this Business Intelligence Dashboard helped the Chief Engineer and staff in optimizing the production processes and minimizing disruptions.

# The way that business intelligence tools help to make effective decisions

## 4.1 How business intelligence tools can contribute to effective decision-making

### 4.1.1 Decision-making process

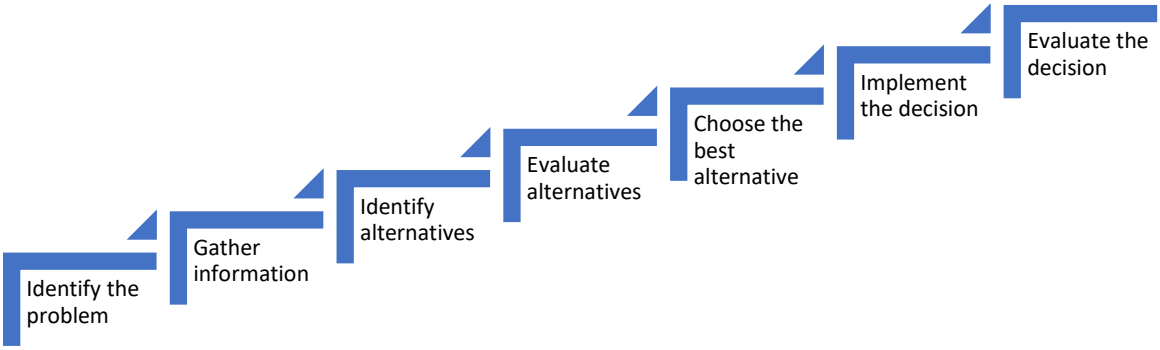



*Figure 4. 1 Decision-making process*

1) Identify the problem: The problem that needs to be solved must be identified as the first step in the decision-making process. This entails comprehending the situation right now and determining any shortcomings or problems that require attention.

2) Gather information: The following step is to acquire as much information as we can regarding the issue after it has been recognized. Research, data analysis, or expert consultation may be required for this.

3) Identify alternatives: Finding possible answers or alternatives to the issue is the next step after information gathering. This may include brainstorming, speaking with others, or reflecting on previous experiences.

4) Evaluate alternatives: It's critical to assess each alternative using a set of criteria after discovering possible solutions. This might involve weighing the benefits and drawbacks of various approaches or evaluating the practicality of alternative approaches using a decision matrix.

5) Choose the best alternative: The best alternative must then be chosen based on the evaluation. Choosing the alternative that best fulfills the predetermined criteria or the alternative with the greatest score in the decision matrix may be involved.

6) Implement the decision: Implementing the decision comes after selecting the best alternative. This entails putting the decision into practice, informing stakeholders about it, and assigning resources as required.

7) Evaluate the decision: Evaluation of the decision and its results is the last step in the decision-making process. This evaluation is conducted to determine whether the choice has been successful in resolving the issue and whether any modifications are required. In order to improve future decision-making, it is critical to incorporate the evaluation's feedback.

### 4.1.2 Key points that explain how business intelligence tools assist in better decision-making

By offering crucial insights into a company's operations and performance, business intelligence solutions can support efficient decision-making by helping Yard of Ale company decision-makers to take reasoned, data-driven judgments.

The following are some key points that explain how business intelligence tools assist in Yard of Ale company to take better decision-making:

- Better data accuracy: The accuracy, consistency, and timeliness of the data are ensured by business intelligence systems. This enables decision-makers to make their decisions on solid evidence in a more informative way. Business intelligence tools assist Yard of Ale company decision-makers in reducing data discrepancies and inconsistencies that can result in false and misleading insights by offering a single source of truth for all data.
- Improved data visibility: Tools for business intelligence combine data from various sources into a single, comprehensive view. Yard of Ale company decision-makers can now easily obtain and analyze data that is important to their decisions. Business intelligence tools assist Yard of Ale company decision-makers in making better educated choices based on a complete understanding of business performance by offering a comprehensive view of data across the company.
- Improved data analysis: Tools for business intelligence offer sophisticated data analytics capabilities that support the identification of trends, patterns, and anomalies in data for decision-makers. They can then make more knowledgeable decisions and acquire greater understanding of how their businesses are performing. Real-time data analysis capabilities provided by business intelligence systems make it simpler for Yard of Ale company decision-makers to spot trends and patterns that may not be immediately apparent through human analysis.
- Real-time reporting: Real-time reports from business intelligence technologies enable Yard of Ale company decision-makers to act swiftly in the face of shifting economic conditions. They are able to act quickly and wisely as a result of this. Business intelligence techniques allow decision-makers to recognize opportunities

and risks as they arise and take the necessary steps by giving them real-time insights on how their companies are performing.

- Predictive analytics: Predictive analytics capabilities offered by business intelligence systems assist decision-makers in forecasting future business performance. As a result, they are better able to allocate resources wisely and prepare for future growth. Business intelligence systems can find trends and patterns using historical data and algorithms, allowing Yard of Ale company decision-makers to predict future company circumstances and take more well-informed decisions.
- KPI monitoring: Key performance indicator (KPI) monitoring features offered by business intelligence tools assist Yard of Ale company decision-makers in monitoring business performance in relation to particular metrics. This enables them to make data-driven decisions and discover areas for development. Yard of Ale company decision-makers may immediately discover areas where the business is underperforming and take action to address these issues by monitoring KPIs in real-time.
- Improved collaboration: By giving Yard of Ale company decision-makers access to a single source of data truth, business intelligence tools encourage collaboration. This makes it possible for Yard of Ale company decision-makers to collaborate more successfully and come to better solutions as a group. Business intelligence solutions can assist decision-makers in aligning their goals and plans and cooperating to achieve better results by supplying a shared view of corporate performance.

**Following is example of Decision-making process for Yard Ale Beverage company using above key 7 steps.**

**1) Identify the problem:**

In the most latest quarter, Yard Ale Beverage Company observed a decline in the sales of its beer products.

**2) Gather information:**

Yard Ale Beverage Company collects data through evaluating sales data, performing market research, and receiving customer feedback.

**3) Identify alternatives:**

With the data acquired, Yard Ale Beverage Company determines alternatives including launching new beer flavors, upgrading product packaging, launching advertising campaigns, and collaborating with local restaurants and pubs.

**4) Evaluate alternatives:**

The Yard Ale Beverage Company can evaluate each alternative by considering its potential effect on sales, as well as its viability, cost, and implementation time.

**5) Choose the best alternative:**

On the basis of the evaluation, Yard Ale Beverage Company decides to launch two new beer flavors and conduct a marketing effort to draw in new clients and keep hold of existing ones.

**6) Implement the decision:**

The choice is put into practice by Yard Ale Beverage Company by introducing the new beer tastes and executing the marketing campaign using multiple platforms like social media, email marketing, and in-store displays.

**7) Evaluate the decision:**

The Yard Ale Beverage Company examines the success of the promotional campaign by examining the sales statistics and consumer feedback a few weeks after the decision has

been put into action. Based on the review, Yard Ale Beverage Company decides whether to continue the promotion and whether to introduce new beers.

### 4.1.3 Conclusion

In conclusion, business intelligence solutions give Yard of Ale company decision-makers access to real-time reporting, advanced analytics, and timely information that enables them to make data-driven decisions. Business intelligence tools give Yard of Ale company decision-makers a comprehensive view of corporate performance, allowing them to spot trends, patterns, and inconsistencies in data, forecast upcoming business circumstances, and monitor performance against predetermined benchmarks. Business intelligence solutions help companies in achieving better results and promoting business expansion and success by enhancing Yard of Ale company's decision-maker collaboration.

# Investigating the legal concerns related to the secure use of business intelligence tools.

## 4.2 Data Security

### 4.2.1 Data Privacy VS Data Security

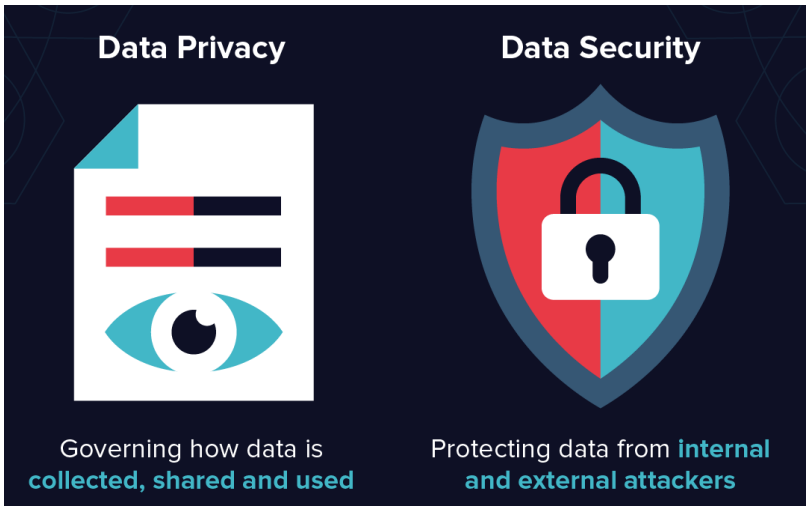



*Figure 4. 2 Data Privacy VS Data Security*

Data privacy is the safeguarding of a person's personal data. Name, address, contact information, e - mail address, the date of birth, the social security number and other sensitive information are examples of personal information. Data privacy aims to ensure that personal data is gathered, handled, and used in a manner that safeguards the person's right to privacy.

On the other side, data security refers to the safeguarding of data against illegal access, misuse, theft, or deletion. Data security aims to protect data from both intentional and unintentional threats, such as malware, device failure, and hackers.

In conclusion, data security focuses on preventing illegal access to and use of all forms of data, while data privacy focuses on safeguarding the privacy of individuals' personal information. Each company that handles sensitive data, including those that use business intelligence technologies, should take both into account.

### 4.2.2 Data Security Issues in Organizations

Organizations of all shapes and sizes must deal with the essential issue of data security. Here are some typical problems with data security that Yard of Ale company may encounter:

- Cyberattacks: Cyberattacks pose a threat to Yard of Ale company because they can lead to data breaches, the loss of personal data, and economic losses.
- Malware and viruses: Data security is significantly threatened by viruses and malware. Systems can become infected, which can result in damage, loss of data, or data theft.
- Insider threats: Sensitive data can be stolen, misused, or handled improperly by staff members, contractors, or business partners, either knowingly or unknowingly leading to data breaches.
- Weak passwords: Cybercriminals can readily access critical data and systems due to weak or easily predicted passwords.
- Lack of encryption: A crucial tool for safeguarding sensitive data is encryption. Data can be easily intercepted and stolen if it is not encrypted.
- Unpatched systems: Systems without security updates or that are out-of-date are susceptible to cyberattacks that take use of known weaknesses.
- Human error: Data breaches can be the result of Yard of Ale company human error, such as providing private information to the incorrect person by accident or not adequately securing data and devices.
- Mobile devices: Due to their propensity for containing sensitive information and ease of loss or theft, mobile devices pose an important threat to data security.

### 4.2.3 Data protection strategies in Business Intelligence

Business intelligence tools require effective safeguards for data. These are some methods for safeguarding business intelligence data:

- Access controls: Only authorized users will be able to access the data in the business intelligence tool due to access controls. The steps to restrict access to sensitive data may include role-based access restrictions, two-factor authentication, and many others.
- Encryption: Encryption can be used to safeguard both data in transit and at rest. Database encryption, transport layer encryption, and file-level encryption are a few examples of this.
- Anonymization: To safeguard people's privacy when working with sensitive data, we can consider about anonymizing the data. This can include methods to hide sensitive information, such as data masking and data obfuscation.
- Backup and recovery: A data recovery plan should be in place in the case of a data loss or breach, and it should be made sure that business intelligence data is frequently backed up.
- Monitoring and auditing: The use of the business intelligence tool should be monitored closely, and data access should be verified. By doing so, it will be easier to trace data changes and to identify and stop unauthorized access.
- Employee training: Employees should get training on best practices for data protection, including handling sensitive data, using access controls, and identifying and addressing security concerns.
- Data retention policies: Specify who has access to the data and how long business intelligence is kept on file. This may help to shield data from illegal access or use.
- Regular security audits: Our business intelligence tools' weaknesses are found through routine security audits, which also guarantee that our data is safe from new threats.

With the help of these strategies, business intelligence tools' data may be safeguarded, and sensitive data can be kept from being accessed by unauthorized parties.

## 4.3 Widely used Data protection laws and regulations

### 4.3.1 Genal Computer Crime Laws

Laws that prohibit numerous computer-related crimes like illegal access, hacking, exploitation of digital property, and virus transmission are known as general computer crime laws, commonly referred to as cybercrime laws or computer fraud and abuse laws. These regulations are intended to safeguard computer networks, systems, and data from illegal activity.

The United States' Computer Fraud and Abuse Act (CFAA), the United Kingdom's Computer Misuse Act, and the Philippines' Cybercrime Prevention Act are a few examples of general computer crime laws. Computer-related theft and hacking are prohibited under the CFAA, and violations are subject to both civil and criminal penalties. Unauthorized access to and manipulation of computer systems and data are crimes under the Computer Misuse Act, and violators receive jail time and penalties. Cyberbullying, online identity theft, and other computer-related offenses are all included by the Philippines' Cybercrime Prevention Act, which carries both fines and jail time as penalties.

**The Computer Fraud and Abuse Act of 1986 (CFA Act) :**

Unauthorized access to computer systems and networks is illegal in the United States under the Computer Fraud and Abuse Act (CFAA). The law was established in 1986 and has since undergone numerous amendments. According to the CFAA, it is unlawful to intentionally gain unauthorized access to a computer, go beyond the scope of that access, or use that access to conduct a crime or harm a computer system. The law covers a wide range of offenses, including hacking, cyber espionage, and computer-based fraud, and it is applicable to both persons and companies.

Depending on how serious the offense was, different punishments may be imposed for CFAA violations. A first-time offender who gains unauthorized access to a computer or uses it more frequently than is permitted faces up to a year in jail and a fine of up to

$100,000. Serial offenders or those who harm computer systems may get a fine of up to $250,000 and a jail sentence of up to 10 years. A person or organization found in violation of the CFAA may also be subject to civil liabilities in addition to criminal sanctions. This may involve penalties, financial compensation, and injunctive relief.

It is important to keep in mind that the CFAA has drawn some debate and criticism, with some arguing that its wording is excessively wide and unclear and that it may be applied to people who may not have intended to hurt others or commit a crime.

**Computer Security Act of 1987 :**

The goal of the United States' Computer Security Act of 1987 is to increase the security of data and computer systems used by the government. The law was passed to safeguard the security and integrity of government computer systems as well as the sensitive and private information handled by the government. Governmental agencies must create and put into practice security strategies and procedures to protect their computer systems and data in accordance with the Computer Security Act. The law also mandates that organizations train and educate staff members who have access to sensitive data.

Depending on the seriousness of the offense, different penalties may be imposed for breaking the Computer Security Act. If the law is broken, an individual or group may be held civilly liable and subject to fines and other penalties. Additionally, any injury or damage brought on by the security breach can be held accountable to the government agency that caused it. Criminal penalties are also stated by the legislation for anyone who purposefully gain unauthorized access to official computer systems or harm those systems. Prison time and monetary fines are two types of criminal penalties.

The Computer Security Act of 1987, which serves to maintain the security and integrity of government computer systems and information, is a significant legislation that establishes both civil and criminal consequences for violations.

### 4.3.2 Privacy Laws

Individuals' personal information is collected, used, disclosed, and protected by organizations under a set of legal rules and guidelines known as privacy laws. With the help of these laws, people should be able to decide who can access their personal information and how it will be used. Data collection, processing, storing, and disclosure may be covered by privacy regulations, which differ between nations and regions. The General Data Protection Regulation (GDPR), the California Consumer Privacy Act (CCPA), and the Personal Information Protection and Electronic Documents Act (PIPEDA) are a few examples of privacy laws from different countries.

**Federal Privacy Act of 1974 :**

The Federal Privacy Act of 1974 is a United States law that governs the gathering, use, and preservation of personal data about persons by the federal government. The law, which is applicable to all federal agencies, aims to safeguard people's privacy by restricting the gathering and sharing of personal data. According to the Federal Privacy Act, federal agencies are expected to explain to people why they are collecting their personal information, how it will be used, and who it may be revealed to. Additionally, the law grants individuals the right to view and update their personal information and forbids organizations from sharing that information with third parties without the owner's permission.

The Federal Privacy Act carries disciplinary action, civil liability, and criminal fines as possible punishments. If caught breaking the law, agencies may be subject to fines of up to $5,000, as well as damages and attorney fees. If someone is determined to have broken the law knowingly and wilfully, they may face jail time and fines as part of their criminal punishment. In general, the Federal Privacy Act of 1974 is a significant piece of legislation that works to safeguard people's privacy by limiting how personal data is gathered and used by government agencies. Because there are both civil and criminal penalties for breaking the law, federal agencies are more likely to take their legal obligations seriously.

**Electronic Communications Privacy Act of 1986 :**

A federal legislation known as the Electronic Communications Privacy Act of 1986 (ECPA) governs government surveillance of electronic communications and unlawful access to electronically stored data. The ECPA expands privacy safeguards to text messages, voicemails, and other types of electronic messaging. The ECPA forbids the interception of electronic communications as well as unauthorized access to electronically stored information and the disclosure of an electronic communication's content. The ECPA has fines and jail time as possible penalties for violations. The specific penalties depend on how serious the offense was, but the maximum penalties are:

- There are fines and prison terms of up to five years for the first crime and up to ten years for the second for intercepting or disclosing electronic communications.
- Fines and up to one year's imprisonment for a first offense and up to five years for a second are imposed for illegal access to electronically stored communications.

Also, people who have had their electronic communications illegally intercepted, accessed, or exposed have the right to file a civil complaint and seek compensation.

**Health Insurance Portability and Accountability Act of 1996 (HIPAA) :**

A federal legislation called the Health Insurance Portability and Accountability Act of 1996 (HIPAA) governs the security and privacy of individual health records (PHI). Healthcare bureaus, insurance companies, and other covered entities are required by HIPAA to safeguard the availability, confidentiality, and integrity of PHI.

National standards are established by HIPAA to safeguard PHI's security and privacy. The following are some of the main HIPAA regulations:

- The Privacy Regulation, which controls how PHI is used and disclosed.
- The Security Rule requires that covered businesses put in place administrative, physical, and technical security measures to protect electronic PHI (ePHI).
- In the event that unsecured PHI is compromised, covered entities are required by the Breach Notification Regulation to notify affected persons as well as the Department of Health and Human Services (HHS).

Significant fines and penalties can be imposed for HIPAA infractions. Depending on how serious the offense was, specific penalties could include:

- Civil fines that can total up to $1.5 million per year and range from $100 to $50,000 for each violation.
- For knowingly or intentionally collecting or revealing PHI in violation of HIPAA, there are legal penalties that can include fines and imprisonment for up to 10 years.
- For some offenses, such as knowing or intentionally collecting or revealing PHI for one's own benefit or with malicious intent, both civil and criminal penalties may be applied.

HIPAA violations can lead to reputational harm and a loss of trust from patients and stakeholders in addition to fines and penalties. To prevent these consequences, covered companies must make sure they adhere by HIPAA laws.

### 4.3.1 Copyright Laws

A legal principle known as copyright law grants the author of an original work the sole authority to use and distribute that work. It safeguards the way an idea is expressed but not the concept itself. Literary, musical, and creative works, as well as computer software and databases, are examples of works that can be protected by copyright.

For instance, if someone writes a piece of software, they own the copyright to it and have control over how it is used and distributed. The owner of the copyright must give permission before allowing anybody else to use the software, or they risk facing legal consequences for copyright violation.

In a similar manner, a musician who creates a song owns the copyright to that song and has control over how it is used and distributed. Everyone else who wishes to use the song must request approval before doing so or risk legal consequences, whether it is for personal or business usage.

**United States Copyright Act of 1976 :**

The creators of original works, including writers, artists, musicians, and other creatives, have certain legal rights and protections under this federal legislation. According to the law, copyright holders have the sole right to make copies of, distribute, and publicly exhibit their works as well as to inspire the creation of derivative works. A violation of a work's copyright can result in civil and criminal consequences under the act. In addition to profits made by the infringer from the use of the copyrighted material, civil fines might also include actual losses incurred by the copyright owner. Statutory damages, which can be given in the range of $750 to $30,000 for each work violated or up to $150,000 for each job if the violation is shown to be willful, may also be given.

Willful copyright infringement is also subject to criminal penalties, which include fines of up to $250,000 and prison terms of up to five years. Repeat offenders' risk higher fines and up to ten years in prison. The act also establishes a variety of restrictions and exemptions related to copyright, such as the fair use doctrine, which permits the restricted use of copyrighted content for activities like criticism, commentary, news reporting,

teaching, scholarship, or research. Additional exclusions include the library and archive exemptions, which permit the preservation and use of copyrighted content by libraries and archives for research and educational purposes, as well as the first sale doctrine, which permits the resale of copyrighted work.

**European Union Copyright Directive :**

The European Union created the European Union Copyright Directive as a legal framework to control copyright law inside the European Union. The directive contains a number of rules designed to uphold the rights of copyright holders and encourage the fair and balanced use of intellectual content.

One of the directive's most important requirements is that internet service providers take steps to prevent the uploading and sharing of content that is protected by a copyright without the owner's consent. This clause, known as Article 17 (formerly known as Article 13), has caused controversy among internet users and content producers who contend that it limits freedom of expression.

According to the directive, member states must set up appropriate enforcement procedures to guarantee that the directive's rules are followed in terms of penalties and fines. On those who are found to be in violation of the order, this may include imposing fines and other punishments. Depending on the type and seriousness of the violation, as well as the legislation of each individual member state, the particular punishments and fines may change.

## 4.4 Data protection laws and regulations around the world

Information privacy regulations differ significantly from region to region and even country to country. Some regions, such as Europe, have implemented strict controls that enforce heavy fines on those who violate the rules, whereas countries, such as the United States, are still struggles with formal and centralized laws that provide cohesive protection. Organizations all over the world are concerned about privacy and protecting personal information. In recent years, new, more comprehensive data privacy laws have been enacted or proposed, and it has become absolutely essential for businesses of all sizes and across all businesses to prioritize the protection of personal data.

Here is a list of Data Protection Laws, Acts, and Regulations from around the world:

1. General Data Protection Regulation (GDPR) - European Union
2. California Consumer Privacy Act (CCPA) - United States
3. Personal Information Protection and Electronic Documents Act (PIPEDA) - Canada
4. Personal Data Protection Act (PDPA) - Singapore
5. Privacy Act 1988 - Australia
6. Lei Geral de Proteção de Dados Pessoais (LGPD) - Brazil
7. Data Protection Act 2018 - United Kingdom
8. Data Protection Law - Israel
9. Personal Data Protection Law - China
10. Data Protection Act - South Africa

1) **General Data Protection Regulation (GDPR) - European Union**

The GDPR is a comprehensive data protection regulation that is applicable to all companies doing business in the EU or handling data belonging to EU citizens. More control over personal data is granted to the individual, strict regulations are placed on data processors and controllers, and severe penalties are applied for violations. GDPR makes sure that businesses abide by strict data protection laws and attempts to increase individual rights to data protection and privacy.

2) **California Consumer Privacy Act (CCPA) - United States**

With the help of the CCPA, Californians now have more control over their personal data. Businesses that gather or sell the personal information of California residents are required to be transparent about the data they gather and the purposes for which they use it. People are also given the option to refuse the sale of their personal information and to access and remove it. With the CCPA, personal information is supposed to be more transparent and under the control.

3) **Personal Information Protection and Electronic Documents Act (PIPEDA) – Canada**

A federal legislation called the Personal Information Protection and Electronic Documents Act (PIPEDA) governs how businesses in the private sector gather, use, and disclose personal information. Before collecting, processing, or disclosing personal information, organizations must get consent from individuals and grant them the right to access and update their personal information. In order to allow for the free exchange of personal information across international borders, PIPEDA attempts to protect people's rights to privacy.

4) **Personal Data Protection Act (PDPA) – Singapore**

A data protection law called the Personal Data Protection Act (PDPA) governs how businesses in Singapore can gather, use, and disclose personal data. Organizations must

acquire consent before collecting, using, or disclosing personal data, and they must take reasonable steps to ensure that the information is secure and correct. The purpose of the PDPA is to increase trust between people and businesses by protecting personal data.

### 5) Privacy Act 1988 – Australia

The collection, use, disclosure, and retention of private data by Australian Government organizations and companies with annual sales of more than $3 million are governed by the Privacy Act 1988. People have the right to view and update their personal information under the Australian Privacy Principles, which require that businesses preserve individuals' privacy by taking reasonable precautions. The Privacy Act attempts to safeguard people's right to privacy while enabling the free exchange of information.

### 6) Lei Geral de Proteção de Dados Pessoais (LGPD) – Brazil

The LGPD is a data protection law in Brazil that governs the handling of personal data. Individuals have the right to view, amend, and delete their personal data, and organizations must acquire consent before processing personal data, according to this law. LGPD also puts rigorous regulations on data controllers and processors, as well as the opportunity for persons to sue for damages in the event of noncompliance. By encouraging innovation and economic expansion, LGPD wants to uphold peoples' rights to privacy.

### 7) Data Protection Act 2018 - United Kingdom

The Data Protection Act 2018 is a UK law which controls how businesses doing business in the UK process personal data. The General Data Protection Regulation (GDPR) of the EU is incorporated into UK legislation, and it replaces the earlier Data Protection Act of 1998.The UK's Data Protection Act 2018 regulates the handling of personal data and makes sure that businesses comply by the GDPR. The Data Protection Act aims to safeguard individuals' rights to privacy and guarantee that businesses handle personal data in a legal and open manner.

### 8) Data Protection Law – Israel

The gathering, use, and disclosure of personal data by companies and organizations is governed by Israel's Data Protection Law. The law also requires businesses to take the necessary security precautions to protect customer information and notify the appropriate authorities and persons when a data breach occurs. The Israeli Privacy Protection Authority is in charge of enforcing the law and conducting investigations into violations.

### 9) Personal Data Protection Law - China

China passed a comprehensive data protection law on August 20, 2021, and it will go into effect on November 1 of that same year. This law is called the Personal Data Protection Law (PDPL). The law is applicable to both domestic processing of personal data within China's borders as well as international processing of personal data relating to Chinese citizens by businesses. Fines and other penalties may apply if the law is broken.

### 10) Data Protection Act - South Africa

The processing of personal information in South Africa is governed by the comprehensive Data Protection Act of South Africa. There are eight data protection principles that data controllers should follow. Additionally, the Act introduced fines and financial compensation for data breaches and other Act violations, as well as required compulsory notification of data breaches.

# Looking up specific examples of businesses that have used business intelligence tools to enhance or improve operations.

## 4.4.1 How Ford used business intelligence tools to enhance or improve operations

**Problems they faced before using business intelligence tools:**

Ford faced issues with supply chain management, production efficiency, and satisfying customer needs, just like many other big automakers. It was challenging for the business to swiftly examine the vast amounts of data it was dealing with from numerous sources. Before to the use of business intelligence technologies, they had difficulty anticipating client needs and making smart decisions regarding inventory and production.

**The BI solution they took:**

To address these issues, Ford built a business intelligence platform that combined data from many sources. They gave instant information about supply chain management, production effectiveness, and customer demands. They analyzed and displayed data in real-time using a range of BI technologies, such as Microsoft Power BI and Tableau.

**How above solutions enhanced their operations:**

Ford was able to enhance supply chain management by lowering costs and improving inventory levels with the help of business intelligence technologies. By pinpointing production bottlenecks and streamlining operations, they were also able to increase production efficiency. Also, they were able to learn more about client preferences and needs, which gave them the information they needed to create more targeted marketing campaigns and raise overall customer satisfaction.

### 4.4.2 How Amazon used business intelligence tools to enhance or improve operations

**Problems they faced before using business intelligence tools:**

Amazon had a number of issues prior to using business intelligence technologies, such as difficulty in comprehending and analyzing customer data. Due to the company's extensive operations, real-time data tracking was challenging, and the management team struggled to immediately gain insights into the company's performance. The business also struggled to effectively manage its enormous inventory and supply chain.

**The BI solution they took:**

Amazon employed several business intelligence solutions, including Amazon QuickSight, Amazon Kinesis, and Amazon Redshift, to address these problems. The administrators of the organization were able to swiftly produce reports and examine a lot of data due to Amazon QuickSight. The company's management was able to make better judgments about inventory and supply chain management because to the usage of Amazon Kinesis to record and interpret real-time data streams. Finally, massive volumes of data were stored and queried using Amazon Redshift, which is very scalable and economical.

**How above solutions enhanced their operations:**

These business intelligence technologies allowed Amazon to drastically improve its operations. Real-time insights on the business performance were made available to the company's managers, who were then better able to decide how to manage inventory and optimize the supply chain. The business was able to track consumer behavior in real-time with the support of Amazon Kinesis, which allowed them to offer a better customer experience. Also, Amazon was able to produce reports fast with the help of Amazon QuickSight, which allowed the business to act promptly based on the knowledge gained through data analysis. Ultimately, the usage of business intelligence technologies allowed Amazon to optimize its processes and offer superior customer service, which helped in the expansion and success of the company.

### 4.4.3 How New York Shipping Exchange (NYSHEX) used business intelligence tools to enhance or improve operations

**Problems they faced before using business intelligence tools:**

Prior to utilizing business intelligence technologies, New York Shipping Exchange (NYSHEX) struggled with the issue of shipping pricing fluctuation and unpredictability, which made it challenging for shippers to budget their shipping costs and make future plans. This led to lost revenue and ineffective operational processes.

**The BI solution they took:**

To resolve this problem, NYSHEX used business intelligence technologies, more specifically a data analytics platform offered by Sisense, to study about industry trends and forecast future shipping rates. Via the platform, NYSHEX is able to monitor and evaluate historical trends and patterns while also tracking real-time data on shipping costs and volume.

**How above solutions enhanced their operations:**

By utilizing these business intelligence technologies, NYSHEX is able to provide its customers with more precise and consistent shipping prices, which has contributed to improved predictability and transparency in the shipping sector. For both shippers and carriers, this has led to increased operating efficiency and decreased costs. The platform has also given NYSHEX the opportunity to improve its own operations by pinpointing problem areas and fostering decision-making.

### 4.4.4 How Netflix used business intelligence tools to enhance or improve operations

**Problems they faced before using business intelligence tools:**

When it came to figuring out client preferences and behavior, Netflix had a number of issues before employing business intelligence technologies. They possessed a ton of information about client watching patterns, ratings, and other aspects, but they lacked an effective method for processing, analyzing, and understanding such information.

**The BI solution they took:**

Netflix began utilizing several business intelligence tools, such as Hadoop for data processing, Tableau for visual analytics, and Amazon Web Services (AWS) for cloud computing, to address this issue. Also, they created their own internal tools, such as Lipstick for monitoring data flows and Genie for data processing.

**How above solutions enhanced their operations:**

By using these business intelligence technologies, Netflix was able to more fully comprehend customer preferences and customize content recommendations to each viewer. By identifying popular genres and themes and securing the rights to complementary content, they also assisted Netflix in optimizing the use of its content inventory. Also, the utilization of cloud computing enabled Netflix to quickly scale up its operations and offer millions of users a smooth user experience. However, the success of Netflix as a top streaming platform has been significantly assisted by the usage of business intelligence technologies.

### 4.4.5 How Hello Fresh used business intelligence tools to enhance or improve operations

**Problems they faced before using business intelligence tools:**

Hello Fresh had difficulty maintaining and optimizing its supply chain before employing business intelligence solutions. They struggled to forecast demand for ingredients and packaging supplies, which resulted in stock shortages or overstocking, wasting goods and services and making a loss in money.

**The BI solution they took:**

To enhance their supply chain management, Hello Fresh adopted business intelligence solutions like Looker and Snowflake. They were able to produce real-time dashboards and reports with Looker, which gave them insights into consumer behavior and demand trends. They combined this data using Snowflake, which enabled them to swiftly and effectively store, process, and analyze enormous amounts of data. As a result, they were able to optimize their supply chain and make data-driven decisions.

**How above solutions enhanced their operations:**

Hello Fresh increased supply chain efficiency and decreased waste by utilizing business intelligence technologies. They were able to precisely forecast demand patterns and modify their inventory levels as necessary. They were able to minimize stockouts and overstocking as a result, which led to substantial cost savings. Also, they leveraged data insights to streamline production procedures and cut waste, which increased their operational effectiveness.

# Considering the usage of business intelligence by companies to increase their target market and level of market competition.

Organizations need to be aware of security legislation to secure the privacy and protection of sensitive information when using business intelligence to increase their target audience and market competitiveness. In order to better customize their products and services to the demands of their customers while also adhering to data privacy and security regulations, they can make use of business intelligence technologies to monitor consumer behavior and preferences.

Without compromising personal information, businesses can get insights into market trends and consumer behavior by using anonymized and aggregated data. Businesses can ensure that their business intelligence activities are consistent with security legislation and maintain consumer trust by employing secure data management methods, such as data encryption and access controls.

Businesses are able to use business intelligence in addition to security legislation to assure the ethical use of customer data. When handling sensitive information, this entails getting consent before collecting and processing the data, utilizing privacy protection methods, and putting strong data security measures in place to prevent unwanted access or data breaches.

Businesses may increase client trust and maintain a good reputation in the market by showcasing a dedication to appropriate data handling. Also, following ethical data practices can assist businesses in avoiding monetary and legal fines for breaking data protection laws.

1) **Expanding Businesses from wholesale to retail, and retail to wholesale:**

In order to help businesses find new prospects for growth and expansion, business intelligence can be used for analyzing consumer data, market trends, and competition behavior. For instance, if a company largely serves the wholesale market, it might use business intelligence to find possible business prospects there. The company may arrive at decisions about product developments, pricing strategies, and marketing strategies that are specific to the retail market by studying consumer data to find trends and patterns in customer behavior.

Similar to this, a company that operates in the retail market might use business intelligence to spot potential business opportunities in the wholesale market. The company can spot potential gaps in the market and create strategies to fill those gaps by examining market trends and competitive behavior. In general, employing business intelligence to spot and capture growth possibilities can assist companies in maintaining market competitiveness and expanding to new markets.

2) **Expanding Businesses from budget customers to premium people and premium customers to budget customers:**

By examining consumer data and seeing patterns and trends, businesses can utilize business intelligence (BI) to broaden their target audience from budget customer to premium customers and vice versa. Businesses can segment their customer bases using BI tools to better target their marketing and product offerings to different consumer segments based on criteria like demographics, income levels, and purchase habits. For instance, a business can utilize BI to determine which products and services are popular with wealthy clients and then modify its pricing and marketing plans appropriately.

They can also utilize BI to find opportunities to provide lower-income customers with more cheap products and services. Organizations may remain competitive in the market and better match the requirements and preferences of various client groups by utilizing BI insights to broaden their target audience.

### 3) Expanding Businesses from local scale to global scale:

By examining consumer data, market trends, and competition plans, businesses can use business intelligence to increase their target audience and market share. Businesses can find new markets and target audiences, create efficient marketing strategies, and grow their operations from a local to a global level by using business intelligence technologies like data mining, predictive analytics, and market segmentation.

With the help of these tools, businesses can collect and analyze consumer information from a variety of geographic and demographic sources, comprehend their requirements and preferences, and designed to transform marketing campaigns that can appeal to a wider audience. Additionally, businesses can spot growth possibilities and maintain an edge over rivals by keeping an eye on market trends and competitor strategy.

The essential points listed below can help businesses use business intelligence to expand their target markets and the level of market competition:

1) **Identifying new market segments:**

Businesses can target new potential markets with specialized marketing campaigns and products/services by using business intelligence to assist them find those markets. In order to identify new markets with untapped potential, this may involve examining consumer demographics, purchasing patterns, and preferences.

These are few steps for using business intelligence to identify new market segments while taking security legislation into account:

- Collect relevant information from a variety of sources, such as internal company data, market analysis, and customer feedback. To ensure compliance with security laws, this data should be obtained in a secure manner.
- Analyze the data using business intelligence tools to spot patterns and trends that can be used to pinpoint new market niches. Any privacy or security concerns should also be taken into account in this research, and any sensitive data should be anonymized or mask.
- Identify new market categories that the company can target based on data analysis. This should consider elements including demographics, geography, and purchasing patterns.
- To reach the new market segments, create targeted marketing strategies. The privacy of the clients should be protected, and these tactics should be created to abide by security regulations.
- Use business intelligence tools to track the effectiveness of the marketing tactics and make any necessary adjustments. Monitoring the effect on the new market sectors and any potential security issues should be part of this.

By adopting these actions, businesses can leverage business intelligence to find new market niches while keeping security regulations in mind. While preserving the security and privacy of clients, this can help the business become more competitive.

**2) Tracking competitors:**

Companies that use business intelligence can keep an eye on the actions of their competitors, including their pricing tactics, new product introductions, and advertising campaigns. They can utilize this information to modify their own strategies and products and to look for new ways to set themselves apart from their rivals.

These are few steps for using business intelligence to tracking competitors while taking security legislation into account:

- Find the rivals that can impact the company directly and indirectly. Sort them depending on their size, markets they serve, products they offer, and where they are located.
- Gather information about competitors that is pertinent, such as their financial performance, marketing plans, consumer opinions, product advancements, and price.
- To find patterns, trends, and insights in the competitor data, use data analytics tools. Consider their advantages, disadvantages, possibilities, and risks to the company.
- Business performance should be compared to that of rivals. Find out where the company is falling short and ways to do better.
- Create a strategy to outperform competitors based on the information obtained from the competitor study. For this plan to be ethically and legally acceptable, it should take into account the applicable security laws.
- Keep an eye on the landscape of rival companies and adapt the plan as necessary in response to any new information or modifications to the security laws.

Businesses may stay ahead of their rivals while maintaining ethical and legal standards by employing business intelligence to track competitors and taking security legislation into account.

### 3) Identifying product trends:

In order to create new products or make existing ones more suited to changing consumer demands, businesses might use business intelligence to identify emerging product trends and consumer preferences.

Companies that use business intelligence can keep an eye on the actions of their competitors, including their pricing tactics, new product introductions, and advertising campaigns. They can utilize this information to modify their own strategies and products and to look for new ways to set themselves apart from their rivals.

These are few steps for using business intelligence to identify product trends while taking security legislation into account:

- Collect relevant information from a variety of sources, such as internal company data, market analysis, and customer feedback. To ensure compliance with security laws, this data should be obtained in a secure manner.
- Data can be gathered and kept in one central area, like a data warehouse or a data lake, if the necessary data sources have been found. Making sure that the data collection complies with security laws like GDPR or HIPAA is crucial.
- Analyze the data using business intelligence tools to spot patterns and trends that can be used to pinpoint new market niches. Any privacy or security concerns should also be taken into account in this research, and any sensitive data should be anonymized or mask.
- The appropriate stakeholders, such as product managers, marketing teams, and sales teams, can be informed of the insights discovered by the data analysis. It is crucial to make sure that the insights are distributed securely and in accordance with security laws.
- Eventually, based on the knowledge gained from the data analysis, the organization can take appropriate action. For instance, they might choose to introduce a new product line, alter an existing product, or concentrate on a different group of clients. It is crucial to make sure that all acts are comply with security laws.

**4) Optimizing pricing strategies:**

By examining information on client demand, competitor price, and product profitability, business intelligence can assist organizations in optimizing their pricing strategy. The best prices for products and services can be established using this data, and chances for discounts, promotions, and bundling can also be found.

These are few steps for using business intelligence to optimizing pricing strategies while taking security legislation into account:

- Data about pricing tactics used by competitors, including their pricing schemes, sales, and discounts, can be gathered with the help of business intelligence tools.
- Identify patterns in client purchase decisions by analyzing data on their behavior, including their price sensitivity, brand loyalty, and willingness to pay.
- Establish the organization's price objectives, taking into account profit margins, market share, and sales volume.
- Create pricing models based on the information acquired in steps one and two while taking the organization's pricing objectives into account.
- Test the pricing techniques and make adjustments in response to the test findings.
- Check pricing compliance to make sure pricing methods adhere to security laws and other legal requirements.

Companies can obtain a competitive edge by optimizing pricing strategies with the help of business intelligence by establishing rates that appeal to customers while maximizing profits and adhering by security regulations.

**5) Improving customer experience:**

Businesses can enhance the customer experience by using business intelligence to gain insights on consumer preferences, behavior, and satisfaction levels. It is possible to use this data to address customer problem areas, personalize interactions, and enhance product and service offerings.

These are few steps for using business intelligence to improving customer experience while taking security legislation into account:

- Use a variety of sources, such as surveys, social media, website analytics, and customer support interactions, to collect information about consumer behavior, preferences, and feedback.
- Use data analytics techniques to examine client data and discover patterns in behavior, tastes, and requirements. This can assist in locating potential improvement areas and chances to improve the client experience.
- Personalize customer encounters by utilizing the knowledge gathered through customer data research. This can be accomplished by providing customized recommendations, targeted advertising, and individualized customer support.
- Use customer data to uncover ongoing issues and challenging areas that consumers encounter and take action to resolve them. This could include simplifying the support procedure, providing options for self-service, and training support workers on how to successfully manage client problems.
- To follow customer feedback and identify problems that customers are having in the present, use social media monitoring tools. Companies might be able to use this to their advantage in order to address problems and enhance customer satisfaction.
- Make sure that all data handling procedures are in compliance with security laws like the GDPR, CCPA and that customer data is gathered and maintained securely.

Companies may build solid customer relationships and boost customer loyalty, which can ultimately result in more revenue and market share, by employing business intelligence to enhance the client experience while taking security regulations into account.

# Conclusion

In conclusion, Yard of Ale is a beverage company that could profit from putting in place business intelligence solutions to support its operational procedures. The company gathers both structured and unstructured data, and it is possible to manage business operations using application software. Gathering, analyzing, and transforming data into useful insights requires a collection of tools and technology known as business intelligence. The company can assist strategic, tactical, and operational decision-making processes by utilizing TPS, MIS, DSS and ESS.

A managerial dashboard for the chief engineer can be created using many data visualization approaches, including widgets to display the necessary information. BI tool implementation can boost an organization's decision-making process and give it a competitive edge. To effectively use BI tools, however, it is important to address any legal, ethical, and professional issues that may arise from exchanging data across the business using a BI tool. In summary, Yard of Ale may make better decisions, work more efficiently, and perform at their best by using business intelligence technologies effectively.

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