BUSINESS INTELLIGENCE

REPORT ASSIGNMENT 1

STUDENT NAME: TRAN QUANG HUY
STUDENT ID: GCD18457
Class: GCD0606

ASSIGNMENT 1 FRONT SHEET

Qualification	**BTEC Level 5 HND Diploma in Computing**		
Unit number and title	Unit 14: Business Intelligence		
Submission date		**Date Received 1st submission**	
Re-submission Date		**Date Received 2nd submission**	
Student Name	Tran Quang Huy	**Student ID**	GCD18457
Class	GCD0606	**Assessor name**	
Student declaration I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.			
		Student's signature	Huy

Grading grid

P1	P2	M1	M2	D1	D2

❒ Summative Feedback:		❒ Resubmission Feedback:
Grade:	**Assessor Signature:**	**Date:**
IV Signature:		

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

TABLE OF PICTURES

INTRODUCTION

Business intelligence (BI) is crucial for the effective management and employment of data. It emerged in the latter part of the 20th century and has become an integral aspect of the decision making processes for prudent companies looking to make use of a host of data relating to customer service, inventory, pricing, and so much more.

Business intelligence concepts refer to the usage of digital computing technologies in the form of data warehouses, analytics and visualization with the aim of identifying and analyzing essential business-based data to generate new, actionable corporate insights.

BI technologies offer present (real-time), historical, and predictive views of internally structured data relating to all departments within an organization, which exponentially enhances operational insight and improves the decision-making process.

Put simply: Business intelligence is the process of discovering valuable trends or patterns in data to make more efficient, accurate decisions related to business goals, aims, and strategies.

As pattern recognition is a decisive part of BI, artificial intelligence in business intelligence plays a pivotal role in the process. When approached correctly, pattern recognition is one of the key hallmarks that distinguishes BI experts from BI amateurs. By helping users to discover integral insights autonomously, AI technologies assist tremendously in pattern recognition, making the process more intuitive, more streamlined, and ultimately – more accurate.

A host of business intelligence concepts are executed through intuitive, interactive tools and dashboards – a centralized space that provides the ability to drill down into data with ease. But more on that later.

BI is a collection of applications and software that analyzes various aspects of data and presents it in forms that enhance decision making. It has evolved from generating rudimentary reports and tools used for the historical query, to include a host of components such as forecasting, online analytical processing, predictive modeling, data management, data mining, and optimization. Armed with these essential tools, companies can accurately assess what is or is not working at present, discern what historical factors occurred to make it so, and readily identify future trends to maximize their potential.

PART 1. The business processes and the mechanisms used to support business decision-making

1. The terms 'Business Process' and 'Supporting Processes'.

1.1. Business Processes

The term business process refers to a collection of activities required to achieve a commercial result. Each business process will have inputs, methods, and outputs. The inputs are what must be in place before the method can be applied. When the method is applied to the inputs, outputs are created.

A business process is a collection of linked tasks that find their end in the delivery of a service or product to a client. A business process has also been defined as a set of activities and tasks that, once completed, will accomplish an organizational goal. The process must involve clearly defined inputs and a single output. These inputs are made up of all of the factors which contribute (either directly or indirectly) to the added value of a service or product. These factors can be categorized into management processes, operational processes and supporting business processes.

There is another definition **A business process** is a collection of related structural activities that produce something of value to the organization, its stakeholders or its customers. It can be part of a larger, encompassing process and it can include other business processes that have to be included in its method. Business processes can be viewed as workflows.

There are three types of business processes: (heflo)

- **Operational (primary) processes:**

Operational processes deal with the core business and value chain, which deliver value to the customer by helping to produce a product or service by representing essential business activities that accomplish business objectives (such as generating revenue).

Example: A bank will have a Customer's account management process, which represents an Operational process.

- **Supporting (secondary) processes:**

Supporting processes do not provide value to customers directly, compared to Operational processes. Instead, Supporting processes handle/help the backside of the core processes and functions within an organization.

Example: A bank will have some Security processes (such as employee ID checks), which represents a Supporting process, helping the core processes of the bank and the workplace to become more secure.

- **Management processes:**

Management processes measure, monitor and control the activities related to business procedures and systems. As well as supporting processes, management processes do not provide value directly to customers.

Example: A bank will have some internal processes such as internal communication process, strategic planning process, etc.

A subprocess is a part of a higher-level process that has it's own goals, inputs, outputs, and owner. Activities are parts of the business process that do not include decision-making, and as such do not require decomposition. Activities might be items such as a shut-off machine, or answer phone.

Organizations review their business process in order to improve their operating efficiencies. Before processes can be improved or re-engineered, the organization would have to define exactly what it is that the company does, who is responsible for doing it, to what standard a process should be completed and how the success of a business process can be determined. This process is called business process mapping and is a key element in re-engineering, process improvement, and quality management.

The need for and advantages of a business process are quite apparent in large organizations. A process forms the lifeline for any business and helps it streamline individual activities, making sure that resources are put to optimal use.

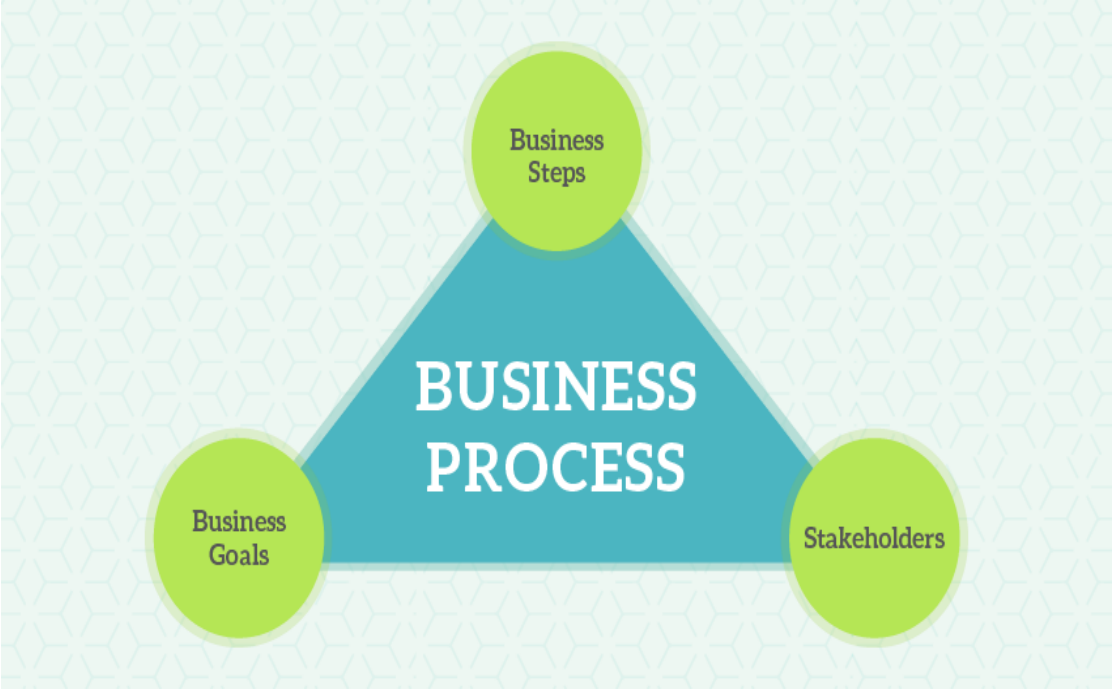


Figure 1. Business process. (kissflow)

Some of the key reasons to have well-defined business processes in place are to:

- Identify what tasks are important to the larger business goals
- Improve efficiency
- Streamline communication between people/functions/departments
- Set approvals to ensure accountability and optimum use of resources
- Keep chaos from creeping into the day to day operations
- Standardize a set of procedures to complete tasks that really matter to business

The 7 steps of the business process:

- **Step 1:** Define the goals
- **Step 2:** Plan and map the process
- **Step 3:** Set actions and assign stakeholders
- **Step 4:** Test the process
- **Step 5:** Implement the process
- **Step 6:** Monitor the results
- **Step 7:** Repeat

1.2. Supporting Processes

Support processes are all processes whose sole purpose is to ensure the functioning of core processes and running the company itself, which coordinates the development and life cycle of the activities contained in the main Operational processes. Those processes can be cross processes, which contribute to the achievement of objectives between different areas of the project and/or company.

These are processes that coordinate the development and life cycle of the activities contained in the main processes, ie organizational and business processes. These processes can be undoubtedly cross processes so that they contribute to the achievement of objectives between different areas of the project and company.

The activities are in support processes, aimed at achieving objectives that support other processes that perform a specialized function. These objectives can point to: (businessprocessincubator)

- Define necessary to record all the information produced by the process of life cycle activities.
- Incorporate activities to identify, control, and statistical evaluation of configurations as well as of version management.
- Define activities to objectively ensure that software products meet the specified requirements and adhere to established plans.
- Specify activities (for the acquirer, the supplier or independent organization) to check software products and services.
- Determine activities (customer, supplier or organization independent) to validate the software products of the software project.
- Perform peer review of both technical and administrative aspects, where they will inspect the condition of the goods produced and the activities undertaken.
- Specify the activities to determine compliance with the requirements, plans, and contracts. This process can be used by any of the two parties, where one party (audit) audits the products or activities of the other party (audited).
- Specify a process to analyze and eliminate (solve) the problems (including disagreements), regardless of their nature or origin, which are discovered during the execution of the development, operation, maintenance, and other processes.

Related terms and methods: (managementmania)

- Business Process
- Core Processes
- Process Map
- Resources (Business resources)
- Task management
- Workflow

Related management field:

- Innovation Management
- Operations Management
- Process Management
- Risk Management
- Security Management

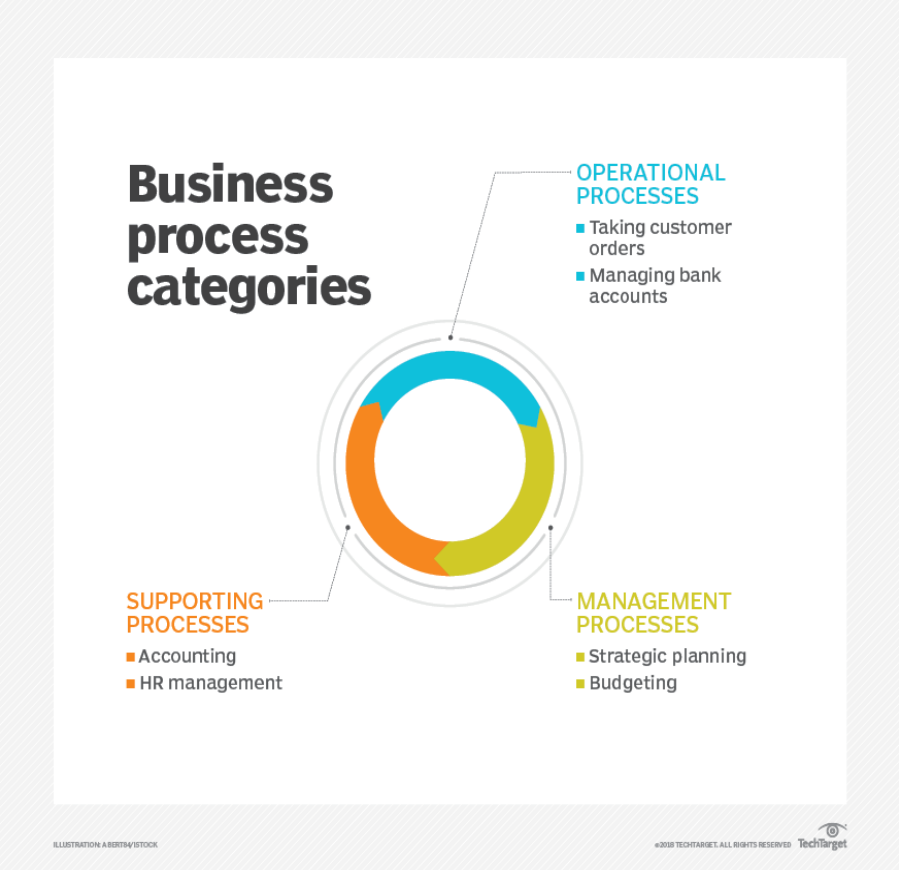


Figure 2. Business process categories. (searchcio)

For instance, support processes include:

- Human Resource Management
- Financial Management processes
- Building and property management, cleaning and maintenance, Facility management
- IT processes
- Procurement and sourcing processes (supplier selection processes, purchasing services, purchasing materials, sourcing human and financial resources, etc.)
- Vendor Management processes
- Operational processes and routine operation and organization management
- Risk Management processes
- Security Management processes
- Corporate Governance processes
- Quality Management processes

Support processes do not directly create products or services but are necessary to facilitate or assist the execution of operating or management processes. Examples of processes that support operating processes are supply procurements, inventory replenishment, and machine maintenance. (ittoday)

2. Differentiate between unstructured and semi-structured data within an organization.

Data manifests itself in many different shapes. Each shape of data may hold much value to the business. In some shapes, this is easier to extract than others. Different shapes of data require different storage solutions and should, therefore, be dealt with in different ways.

There are three different data structures, including **Unstructured data**, **Semi-structured data**, and **Structured data**:

Figure 3. Type of data. (building-blocks)

For the analysis of data, it is important to understand that there are three common types of data structures:

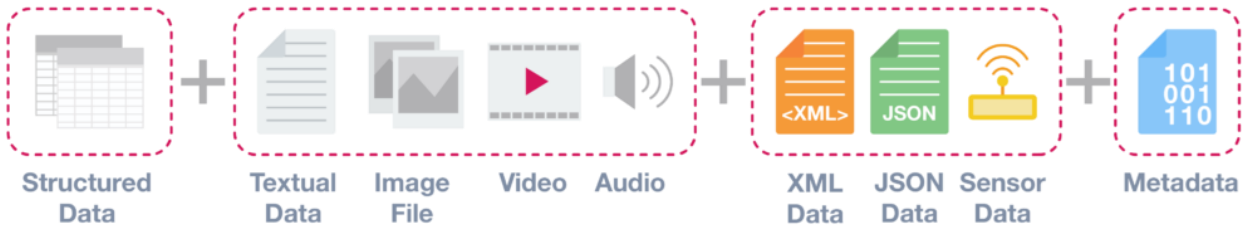


Figure 4. Common types of data. (bigdataframework, bigdataframework)

2.1. Unstructured data

Unstructured data is information that either does not have a predefined data model or is not organized in a pre-defined manner. Unstructured information is typically text-heavy but may contain data such as dates, numbers, and facts as well. This results in irregularities and ambiguities that make it difficult to understand using traditional programs as compared to data stored in structured databases. Common examples of unstructured data include audio, video files or No-SQL databases. (bigdataframework, bigdataframework)

The ability to store and process unstructured data has greatly grown in recent years, with many new technologies and tools coming to the market that is able to store specialized types of unstructured data. MongoDB.

An example is optimized to store documents. Apache Giraph, as an opposite example, is optimized for storing relationships between nodes.

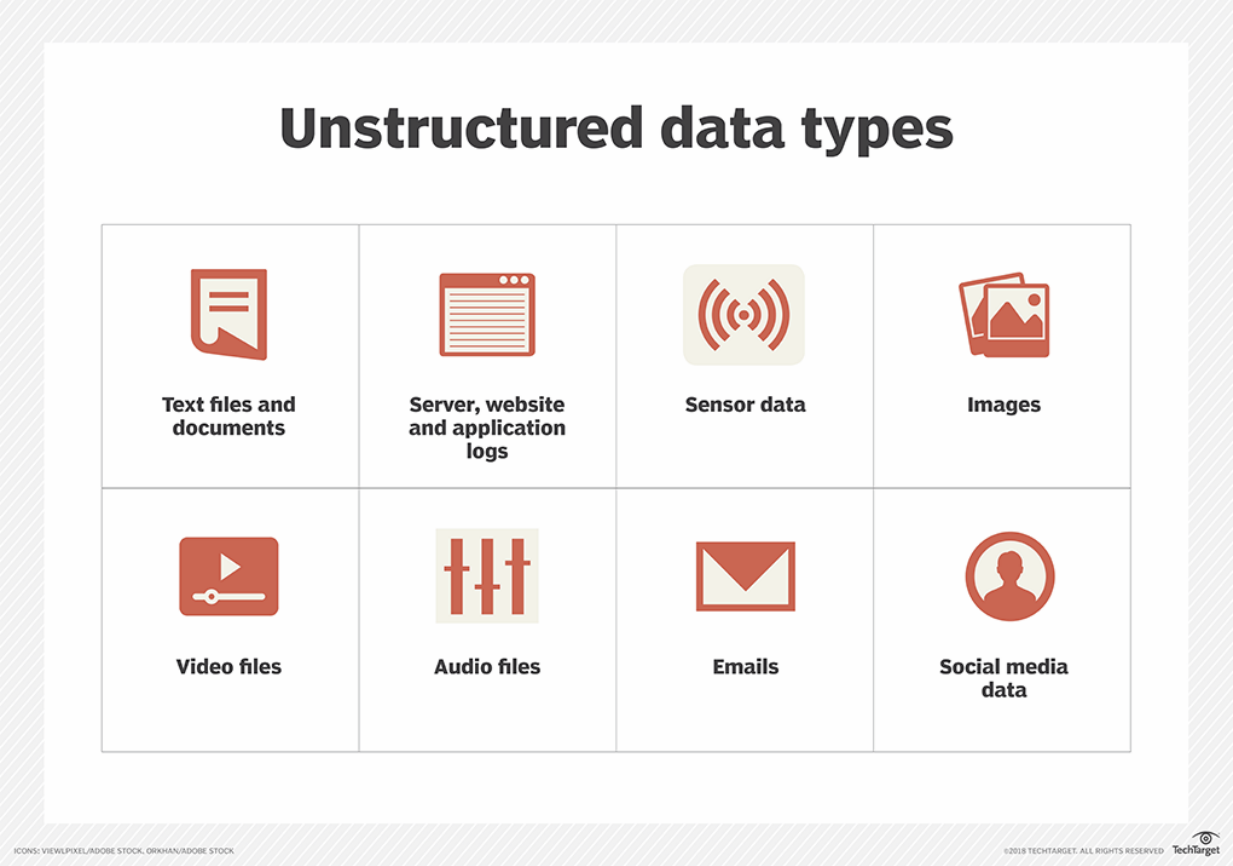


Figure 5. Unstructured data types. (searchbusinessanalytics)

The ability to analyze unstructured data is especially relevant in the context of Big Data since a large part of data in organizations is unstructured. Think about pictures, videos or PDF documents. The ability to extract value from unstructured data is one of the main drivers behind the quick growth of Big Data.

Because **80%** of all data being created is unstructured, organizations that want to make data-driven decisions but are not exploring their unstructured data are missing out on tremendous potential. Taking advantage of current technology to efficiently analyze unstructured data provides insight into important behavioral trends. Most importantly, it moves beyond "what" buyers think into "why" current and potential buyers in the marketplace are engaging with or shifting their business elsewhere. By understanding the "why" behind the "what," organizations are able to meet customer needs and expectations more effectively while also making strategic decisions for bottom-line impact. (oriresults, oriresults)

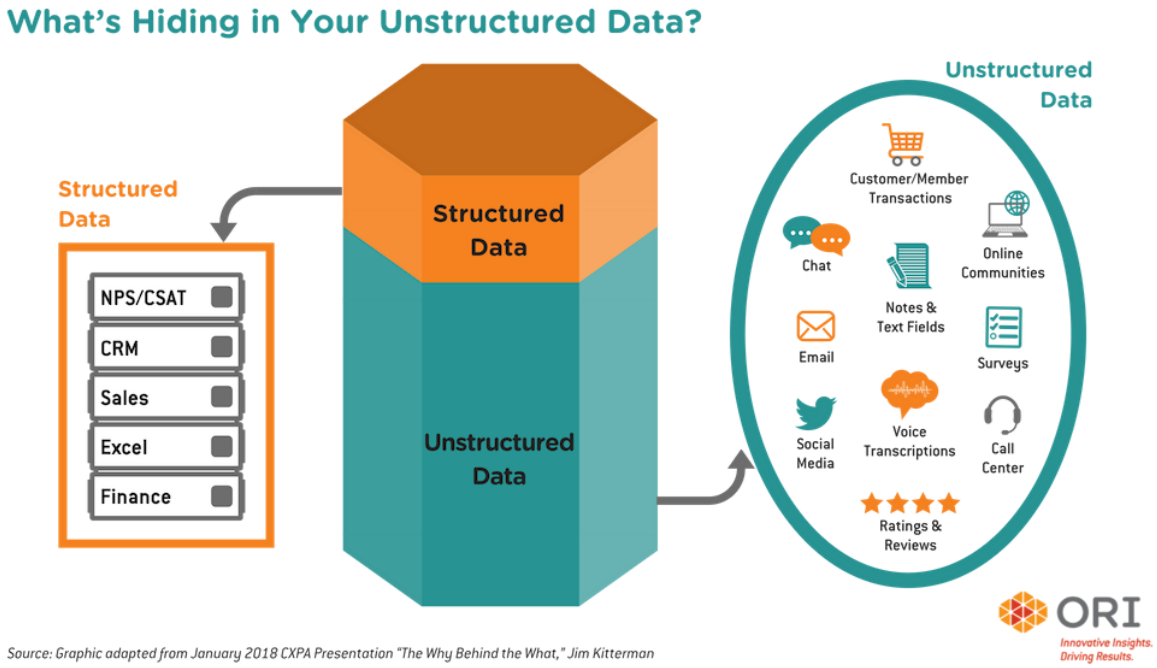


Figure 6. What's hiding in your Unstructured Data?. (oriresults, oriresults)

2.2. Semi-structured data

Beyond structured and **unstructured data**, there is a third category, which basically is a mix between both of them. The type of data defined as semi-structured data has some defining or consistent characteristics but doesn't conform to a structure as rigid as is expected with a relational database. Therefore, there are some organizational properties such as semantic tags or metadata to make it easier to organize, but there's still fluidity in the data. (forbes)

Semi-structured data is a form of structured data that does not conform with the formal structure of data models associated with relational databases or other forms of data tables, but nonetheless contain tags or other markers to separate semantic elements and enforce hierarchies of records and fields within the data. Therefore, it is also known as a self-describing structure. Examples of semi-structured data include JSON and XML are forms of semi-structured data. (bigdataframework, bigdataframework)

The reason that this third category exists (between structured and unstructured data) is that semi-structured data is considerably easier to analyze than unstructured data. Many Big Data solutions and tools have the ability to 'read' and process either JSON or XML. This reduces the complexity to analyze structured data, compared to unstructured data.

Sources of semi-structured Data: (geeksforgeeks)

- Emails
- XML and other markup languages
- Binary executables
- TCP/IP packets
- Zipped files
- Integration of data from different sources
- Web pages

Figure 7. Example semi-structured data

2.3. The Different between unstructured data and semi-structured data

The following are the important differences between Semi-structured Data and Unstructured Data:

Sr. No.	Key	Semi-Structured Data	Unstructured Data
1	Level of organizing	On another hand, in the case of Semi-Structured Data, the data is organized up to some extent only and rest is non-organized hence the level of organizing is less than that of Structured Data and higher than that of Unstructured Data.	In last the data is fully non-organized in the case of Unstructured Data and hence the level of organizing is lowest in the case of Unstructured Data.
2	Means of Data Organization	While in the case of Semi-Structured Data is partially organized by the means of XML/RDF.	On the other hands in the case of Unstructured Data data is based on simple character and binary data.
3	Transaction Management	In Semi-Structured Data transaction is not by default but is get adapted from DBMS but data concurrency is not present.	While in Unstructured Data no transaction management and no concurrency are present.
4	Versioning	On the other hands in case of Semi-Structured Data versioning is done only where tuples or graph is possible as partial database is supported in case of Semi-Structured Data.	Versioning in the case of Unstructured Data is possible only as on whole data as no support of database at all.
5	Flexible and Scalable	While in case Semi-Structured Data data is more flexible than Structured Data but less flexible and scalable as compared to Unstructured Data.	As there is no dependency on any database so Unstructured Data is more flexible and scalable as compared to Structured and Semi-Structured Data.
6	Performance	On the other hand in case of Semi-Structured Data only queries over anonymous nodes are possible so its performance is lower than Structured Data but more than that of Unstructured Data	While in the case of Unstructured Data only textual queries are possible so performance is lower than both Structured and Semi-Structured Data.

Table 1. The difference between unstructured data and semi-structured data. (tutorialspoint)

If almost all unstructured data actually contains some kind of structure in the form of metadata, the reality is that the border between truly unstructured data and semi-structured data is quite fuzzy.

Semi-structured data may lack organization and certainly is an entirely distinct subject from the rigorous organization of the information contained in a relational database. But the presence of metadata really makes the term Semi-structured more appropriate than Unstructured data.

So, for data, structured data is easily organizable and follows a rigid format; unstructured is complex and often qualitative information that is impossible to reduce to or organize in a relational database and semi-structured data has elements of both.

3. The benefits and drawbacks of using application software as a mechanism for business processing.

3.1. Application Software

Application software is all the computer software that causes a computer to perform useful tasks beyond the running of the computer itself. A specific instance of such software is called a software application, application program, application or app.

Application software (app for short) is a program or group of programs designed for end-users. Examples of an application include a word processor, a spreadsheet, an accounting application, a web browser, an email client, a media player, a file viewer, an aeronautical flight simulator, a console game or a photo editor. The collective noun application software refers to all applications collectively. This contrasts with system software, which is mainly involved with running the computer. (wikipedia, wikipedia)

Basic types of application software:

- Word processing software: Allows users to create, edit a document.

  Example: MS Word, Word Pad, etc.

- Spreadsheet Software: Allows users to create documents and perform the calculation.

  Example: Excel, Lotus, etc.

- Database software: Allows the user to store and retrieve the various amount of data.

  Example: MS Access, MySQL, Oracle, SQL Server, etc.

- Presentation Graphic Software: Allows users to create a visual presentation.

  Example: MS power Point, Digital Dashboard

- Multimedia Software: Allows the user to create the image, audio, video, etc.

  Example: Real Player, Media Player, etc.

Some example application software was used:

- Bank
- Business
- E-commerce
- Education
- Engineering
- Government
- Law
- Media
- Medicine
- Science

Some types of application software:

- Accounting
- Computer-Aided Engineering (CAE)
- Computer-Aided Design (CAD)
- Computer-Aided Learning (CAL)
- Database
- Data Mining
- Decision Making
- Desktop Publishing
- Email
- Graphics
- Presentation
- Project management
- Simulation

3.2. Integrated Application Software

Integrated software is software for personal computers that combines the most commonly used functions of many productivity software programs into one application.

The integrated software genre has been largely overshadowed by fully functional office suites, most notably Microsoft Office, but at one time was considered the "killer application" type responsible for the rise and dominance of the IBM PC in the desktop business computing world.

A good example of an integrated software package is Microsoft Office, which contains programs used in an office environment (Excel, Outlook, and Word).

3.3. Application software in Marketing

Customer Relationship Management Software (CRM)

With each phone call from a sales rep, every email from a marketer, the prospects (hopefully) inch closer to the ultimate goal: purchase. But, keeping track of them at every stage of the customer journey is no easy task.

Most times data like this end up buried in a spreadsheet or lost on a company laptop. With a CRM, entire marketing and sales departments can track every interaction between customers and their business, and maintain relevant communication throughout the buyer's journey.

- **What it's used for**: Monitoring and tracking customer relationships
- **Top marketers adoption rate vs. all others**: 76% to 76%
- **Popular tools**: Salesforce, Microsoft Dynamics, HubSpot CRM, Keap (formerly Infusionsoft), Zoho CRM

Video conferencing solution

Today, remote teams are more popular than ever, which means so are video conferencing tools that enable face-to-face meetings over the internet. Whether using them to vet potential clients, interview freelancers, or collaborate with team members, they're a powerful addition to any marketing stack.

- **What it's used for**: Collaborating and meeting face-to-face virtually
- **Top marketers adoption rate vs. all others**: 67% to 59%
- **Popular tools**: Google Hangout, ClickMeeting, join.me, Skype, Adobe Connect

Email marketing software

After all these years and updated technologies, email is still marketers' most valuable channel, producing $38 in ROI for every $1 spent. Service providers like MailChimp and Constant Contact allow teams to segment their leads and customers to send highly relevant messages used to nurture them to sell.

- **What it's used for**: Nurturing leads to conversion, transactional messaging
- **Top marketers adoption rate vs. all others**: 64% to 61%
- **Popular tools**: MailChimp, Constant Contact, Campaigner, Campaign Monitor, GetResponse, SendGrid, Mandrill

Marketing automation software

Providing personalization at scale isn't easy. The team is only so big, and it has to keep up with a continually growing customer base. Marketing automation was created to help businesses take a hands-off approach to offer relevant buyer experiences.

Tools like Autopilot allow to track the behavior of anonymous visitors to website, then guide them all the way to purchase with automated, personalized messages across channels like SMS, email, and direct mail.

- **What it's used for**: Automating marketing tasks throughout the customer journey while maintaining a personal touch
- **Top marketers' adoption rate vs. all others**: 58% to 50%
- **Popular tools**: Autopilot, Marketo, Pardot, Eloqua

Print material and solutions

According to software solution Priint, more than 25% of touchpoints in the customer journey is relevant for print. Offline marketing collateral like brochures, pamphlets, direct mail anything that can brand and use to inform and entertain the customers are still relevant today.

In fact, according to a 2016 report from Content Marketing Institute, the most used paid advertising mediums by B2B businesses rank as follows:

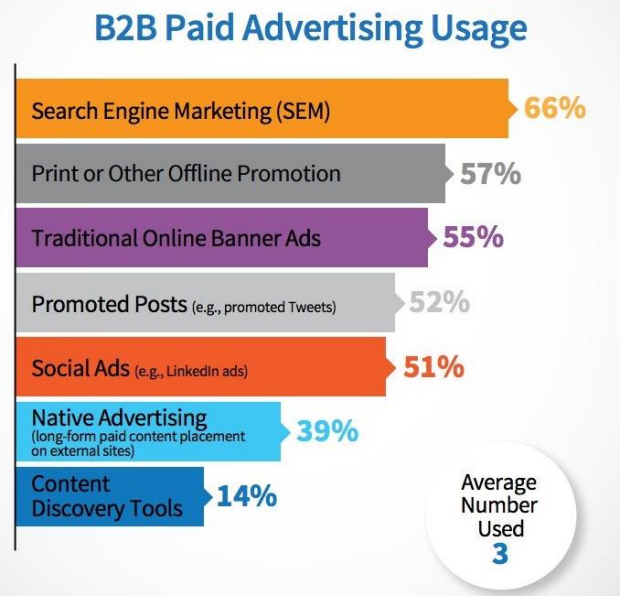


Figure 8. B2B businesses rank

With still so many marketers relying on print materials to guide prospects through the customer journey, it's crucial for businesses to have a way to turn their digital content into print-friendly formats. Plugins from technology like Priint allow marketers to integrate creative tools from Adobe to quickly automate the transfer of online designs to offline mediums.

- **What it's used for**: Converting the digital content into print-friendly formats
- **Top marketers' adoption rate vs. all others**: 52% to 50%
- **Popular tools**: Sitecore Print Experience Manager, Priint: Suite

Analytics and data visualization solutions

At the heart of every marketing technology ecosystem should be a powerful analytics tool. Without the ability to measure the performance of the marketing efforts, you'll have no idea if your campaigns are producing positive ROI, which, according to industry reports, is one of the biggest challenges facing businesses today.

Who's visiting your website? How are they interacting with it? What are prospects paying attention to? These are all questions that analytics and data visualization tools can answer. It's no coincidence that the biggest disparity in adoption between top-notch marketers and all others is in this category.

- **What it's used for**: Measuring the performance of marketing efforts
- **Top marketers' adoption rate vs. all others**: 52% to 33%
- **Popular tools**: Crazy Egg, EyeQuant, Google Analytics, Kissmetrics Analytics, HotJar

Content management software

Back in the early days of the web, you had to know your way around the "back end" of a website to publish and edit any online content. Coding know-how and programming experience were a requirement for anyone who wanted to develop web pages. Today, that's no longer the case. Tools like WordPress and Drupal allow you to build websites and post content to the internet in minutes without any prior coding knowledge.

- **What it's used for**: Publishing content to the web quickly and easily
- **Top marketers' adoption rate vs. all others**: 52% to 51%
- **Popular tools**: WordPress, Drupal, Joomla, Wix, Squarespace

SEO solutions

Nearly 60% of businesses spend between $1,000 and $5,000 on search engine optimization tools every month. That's not surprising, considering 78% of marketers say they find positions 1-3 on search engine results pages to produce the highest number of clicks. This category of software will help you spy on competitor strategies, find unique link-building opportunities, and optimize your content for search engines.

- **What it's used for**: Improving your business's visibility in search engines
- **Top marketers' adoption rate vs. all others**: 42% to 47%
- **Popular tools**: Moz, Ahrefs, DeepCrawl, SEMrush

Business intelligence software

You can't make informed business decisions without all the facts. Integrating your software to create a seamless customer journey is important, but so is integrating your software to get a better view of your business's performance.

Business intelligence tools pull critical data from different departments, documents, and other software, to provide decision-makers with the information they need to choose where to go next.

- **What it's used for**: Data collection and analysis on a large scale
- **Top marketers' adoption rate vs. all others**: 33% to 27%
- **Popular tools**: Domo, Microsoft Power BI, Tableau Desktop

3.4. The advantages and disadvantages of using Application

The Advantages:

- Their single biggest advantage is that they meet the exact needs of the user. Since they are designed specifically with one purpose in mind, the user knows that he has to use one specific software to accomplish his task.
- The threat of viruses invading custom-made applications is very small, since any business that incorporates it can restrict access and can come up with means to protect their network as well.
- Licensed application software gets regular updates from the developer for security reasons. Additionally, the developer also regularly sends personnel to correct any problems that may arise from time to time.
- Application developers don't need to give time and attention to lower-level processes and execution.
- Developers can focus on their application development.
- Ease in communication between system and peripherals.
- Perform the conversion task from one programming language to another.
- It helps to maintain the system in good condition and detect viruses.
- Perform tedious tasks like disk partitioning, defragmentation, etc.
- Their single biggest advantage is that they meet the exact needs of the user. Since they are designed specifically with one purpose in mind, the user knows that he has to use one specific software to accomplish his task.
- The threat of viruses invading custom-made applications is very small, since any business that incorporates it can restrict access and can come up with means to protect their network as well.
- Licensed application software gets regular updates from the developer for security reasons. Additionally, the developer also regularly sends personnel to correct any problems that may arise from time to time.

The Disadvantages:

- Developing application software designed to meet a specific purpose can prove to be quite costly for developers. This can affect their budget and their revenue flow, especially if too much time is spent developing software that is not generally acceptable.
- Some software that is designed specifically for a certain business, may not be compatible with other general software. This is something that can prove to be a major stumbling block for many corporations.
- Developing them is something that takes a lot of time because it needs constant communication between the developer and the customer. This delays the entire production process, which can prove to be harmful in some cases.
- Application software that is used commonly by many people, and then shared online, carries a very real threat of infection by a computer virus or other malicious programs.
- It doesn't meet the exact needs of users.
- Costly if prefer licensed and reputed organizations system.
- System software developers must have detailed knowledge of low-level languages and machine-related activities.
- It takes a longer time to develop or update the system software.
- Developing application software designed to meet specific purposes can prove to be quite costly for developers. This can affect their budget and their revenue flow, especially if too much time is spent developing software that is not generally acceptable.
- Some software that is designed specifically for a certain business, may not be compatible with other general software. This is something that can prove to be a major stumbling block for many corporations.
- Developing them is something that takes a lot of time because it needs constant communication between the developer and the customer. This delays the entire production process, which can prove to be harmful in some cases.
- Application software that is used commonly by many people, and then shared online, carries a very real threat of infection by a computer virus or other malicious programs.

Part 2. The tools and technologies associated with business intelligence functionality

1. Compare the types of support available for business decision-making at varying levels within an organization.

In general, the decision-making process helps managers and other business professionals solve problems by examining alternative choices and deciding on the best route to take. Using a step-by-step approach is an efficient way to make thoughtful, informed decisions that have a positive impact on your organization's short- and long-term goals.

The business decision-making process is commonly divided into seven steps. Managers may utilize many of these steps without realizing it, but gaining a clearer understanding of best practices can improve the effectiveness of your decisions.

The business decision-making process is commonly divided into seven steps. Managers may utilize many of these steps without realizing it, but gaining a clearer understanding of best practices can improve the effectiveness of your decisions: (csp)

- Identify the decision
- Gather information
- Identify alternatives
- Weigh the evidence
- Choose among alternatives
- Take action
- Review your decision

Understanding the various levels of an organization is essential to understand the information required by the users who operate at their respective levels. The following diagram illustrates the various levels of a typical organization.

Figure 9. Pyramid Diagram of Organizational levels and information requirements. (guru99)

Strategic decision

Base on Şebnem Yılmaz Balaman, in Decision-Making for Biomass-Based Production Chains, 2019

Strategic decisions have a long-term impact on the performance of the supply chain which may need revisions after a long time period of usually three or more years. It focuses on the structural decisions related to the chain's configuration and infrastructures, the strategies to allocate resources, and the technologies to perform processes at each stage. They are usually taken at the highest levels of management, including a wide range of uncertainties and carry higher levels of risk. However, effective strategic decisions lead to increased profitability and high levels of rewards for all stakeholders in the supply chain. The issues that require strategic decision-making in biomass-based production chains include:

- Choosing the location, site, installed capacity and purpose of biomass-based production and storage (centralized or decentralized) facilities
- Selection of conversion and treatment technologies and processes.
- Configuration of a network of suppliers, distributors, and logistics handlers.
- Long-term inventory management strategies
- Long-term technological improvement and capacity planning analyses.
- Sourcing strategies, long-term supply, and demand contracts.
- Ensuring economic, environmental, technical, and social sustainability

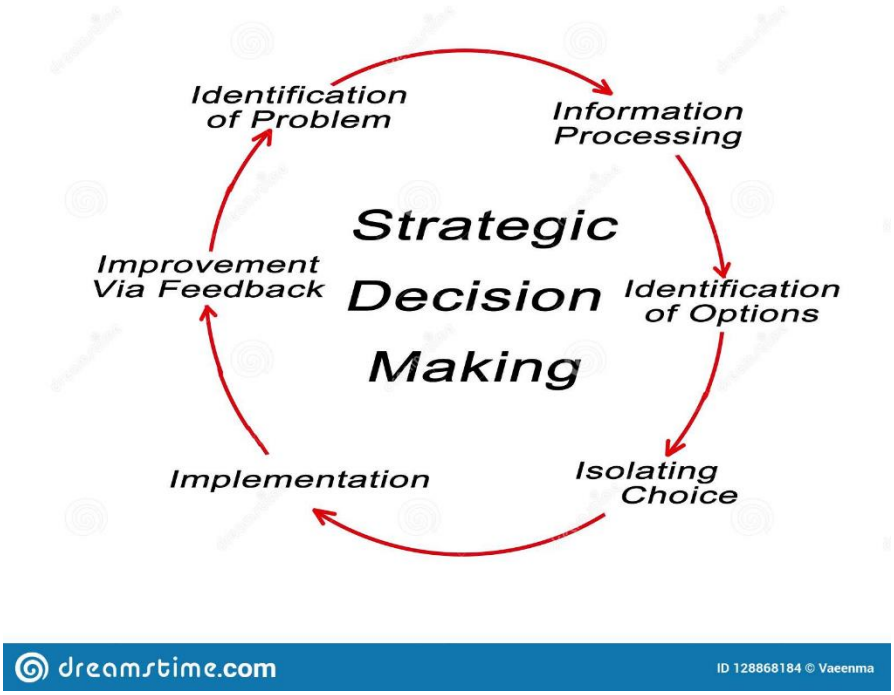


Figure 10. managerial decision making. (dreamstime)

To summarise, strategic decision making involves the following things: (korefacts)

- Analyzing Problems
- Making decisions in a dynamic of uncertainty
- Build adaptability in your decisions
- Provide the leadership to mitigate the effects cognitive of biases
- Understand the role of emotions and ethics in decision making
- Develop tools to improve individual and organizational decision making
- The long term way forward for the company
- Selection of proper markets for the company
- The products and tactics needed to succeed in the targeted market.

Overall, a firm can move forward only if it has taken the necessary strategic decisions. Furthermore, whether the decisions were right or wrong, can only be proved only over a long period of time. If these decisions were right and had great insight into the future, then the company can be very successful. However, if these strategic decisions did not consider empirical evidence of the current market conditions, then the firm can fail badly. (marketing91)

Operational decision

Operational decisions are specific business decisions made every day within every business. There are millions of these taken – and thousands of different types. Everyday business uses operational decisions to run day-to-day activities by different personnel. Not a day goes by without these types of a decision being made in every business.

There are some examples of operational decisions in the day-to-day operations of a business:

- How much tax should this customer pay?
- What are the products or services that can be offered to a customer?
- Is this transaction likely to be fraudulent?
- How do we handle exceptions in this claim process?
- Are we compliant with state regulations?

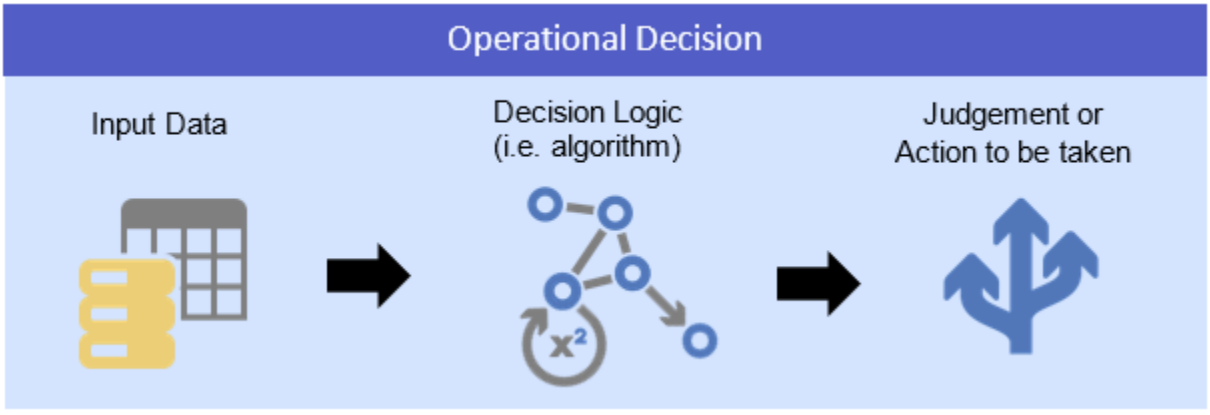


Figure 11. Operational Decision structure. It includes the "decision logic", input data and the conclusion. (flexrule)

Managerial decision

The managerial decision-making process is not as easy as people probably think so. Managers need to analyze each and every aspect of the business before reaching any decision. All the operations and the body of the organization depend on effective and logical decisions made by the management authorities. Typically, every individual who is unaware of the concept of managerial decision making and its process would like to know from starting to its present uses in today's trends, i.e. globalization, entrepreneurship and e-business world, etc. There are a few basic questions such as what the decision and decision making is, that may clear the perception of the basic idea of decision making and eventually will lead to the concept of managerial decision making.

Managerial Decision Making is one of the most critical processes in every organization. Successful and effective decision making gives profitable outcomes, whereas unsuccessful decision making causes a great loss. The use of several tools and techniques is possible in the entire process, as the management team has to choose one beneficial decision from a range of many. Besides, several perceptions can also help to identify and solve any issue. Additionally, a few managers also like to make decisions on their own or give priority to a collective decision.

As decision-making is a hard process, so sometimes, it involves dissatisfaction with another party. For preventing all the major conflicts and hurdles in decision-making, managers should follow the professional process of making managerial decisions. The following is the entire process of managerial decision making. (businessstudynotes)

The decision-making process involves the following 8 main and important steps:

- Purpose identification
- Gathering information
- Alternatives judgment principles
- Brainstorming and analyzing the choices
- Alternatives' Evaluation
- Pick the best Alternative
- Result evaluation
- Execute the decision

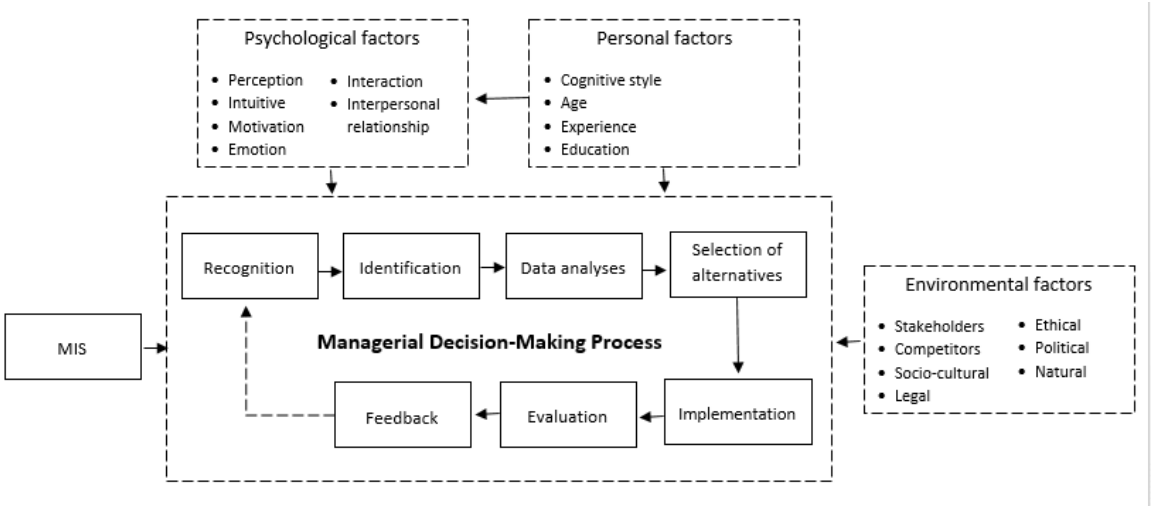


Figure 12. Managerial Decision-Making Process. (researchgate)

1.1. Operational management level

This Operational Management Level is the lowest level of an organization's management, concerned with performing day-to-day operations of the organization. Operational decisions have a short-term horizon as they are taken repetitively, taken based on facts regarding the events and do not require much of business judgment. (guru99)

Examples of users at this level of management include cashiers at a point of sale, bank tellers, nurses in a hospital, customer care staff, etc.

Users at this level use make structured decisions. This means that they have defined rules that guide them while making decisions.

For example, if a store sells items on credit and they have a credit policy that has some set limit on the borrowing. All the salesperson needs to decide whether to give credit to a customer or not is based on the current credit information from the system.

Transaction processing systems are used to record day to day business transactions of the organization. They are used by users at the operational management level. By recording the day to day business transactions, the TPS system provides answers to the above questions in a timely manner:

- The decisions made by operational managers are routine and highly structured.
- The information produced by the transaction processing system is very detailed.

For example, banks that give out loans require that the company that a person works for should have a memorandum of understanding (**MoU**) with the bank. If a person whose employer has an **MoU** with the bank applies for a loan, all that the operational staff has to do is verify the submitted documents. If they meet the requirements, then the loan application documents are processed. If they do not meet the requirements, then the client is advised to see tactical management staff to see the possibility of signing an **MoU**.

Examples of transaction processing systems include:

- Point of Sale Systems: records daily sales
- Payroll systems: processing employees salary, loan management, etc.
- Stock Control systems: keeping track of inventory levels
- Airline booking systems: flights booking management

1.2. Tactical management level

This organization level is dominated by middle-level managers, heads of departments, supervisors, etc. The users at this level usually oversee the activities of the users at the operational management level.

Tactical users make semi-structured decisions. The decisions are partly based on set guidelines and judgmental calls. As an example, a tactical manager can check the credit limit and payment history of a customer and decide to make an exception to raise the credit limit for a particular customer. The decision is partly structured in the sense that the tactical manager has to use existing information to identify a payment history that benefits the organization and an allowed increase percentage.

Management Information Systems (MIS) are used by tactical managers to monitor the organization's current performance status. The output from a transaction processing system is used as input to a management information system.

The MIS system analyzes the input with routine algorithms i.e. aggregate, compare and summarizes the results to produced reports that tactical managers use to monitor, control and predict future performance.

For example, input from a point of sale system can be used to analyze trends of products that are performing well and those that are not performing well. This information can be used to make future inventory orders i.e. increasing orders for well-performing products and reduce the orders of products that are not performing well.

Examples of management information systems include:

- **Sales management systems**: they get input from the point of sale system
- **Budgeting systems:** gives an overview of how much money is spent within the organization for the short and long terms.
- **Human resource management system:** overall welfare of the employees, staff turnover, etc.

Tactical plans support strategic plans by translating them into specific plans relevant to a distinct area of the organization. Tactical plans are concerned with the responsibility and functionality of lower-level departments to fulfill their parts of the strategic plan.

For example, when Huy, the middle-level manager at GCD's, learns about Hieu's strategic plan for increasing productivity, Huy immediately begins to think about possible tactical plans to ensure that happens. Tactical planning for Huy might include things like testing a new process in making pizzas that has been proven to shorten the amount of time it takes for prepping the pizza to be cooked or perhaps looking into purchasing a better oven that can speed up the amount of time it takes to cook a pizza or even considering ways to better map out delivery routes and drivers. As a tactical planner, Huy needs to create a set of calculated actions that take a shorter amount of time and are narrower in scope than the strategic plan is but still help to bring the organization closer to the long-term goal.

Tactical managers are responsible for the semi-structured decision. MIS systems provide the information needed to make the structured decision and based on the experience of the tactical managers, they make judgment calls i.e. predict how much of goods or inventory should be ordered for the second quarter based on the sales of the first quarter. (guru99)

1.3. Strategic management level

This is the most senior level in an organization. The users at this level make unstructured decisions. Senior-level managers are concerned with the long-term planning of the organization. They use information from tactical managers and external data to guide them when making unstructured decisions.

Decision support systems are used by senior management to make non-routine decisions. Decision support systems use input from internal systems (transaction processing systems and management information systems) and external systems.

Strategic management provides overall direction to an enterprise and involves specifying the organization's objectives, developing policies and plans to achieve those objectives, and then allocating resources to implement the plans. Academics and practicing managers have developed numerous models and frameworks to assist in strategic decision-making in the context of complex environments and competitive dynamics. Strategic management is not static in nature; the models often include a feedback loop to monitor execution and to inform the next round of planning. (wikipedia, wikipedia)

Decision support systems are used by senior management to make non-routine decisions. Decision support systems use input from internal systems (transaction processing systems and management information systems) and external systems.

The main objective of decision support systems is to provide solutions to problems that are unique and change frequently. Decision support systems answer questions such as:

- What would be the impact of employees' performance if we double the production lot at the factory?
- What would happen to our sales if a new competitor entered the market?

Decision support systems use sophisticated mathematical models, and statistical techniques (probability, predictive modeling, etc.) to provide solutions, and they are very interactive.

Examples of decision support systems include:

- **Financial planning systems**: it enables managers to evaluate alternative ways of achieving goals. The objective is to find the optimal way of achieving the goal. For example, the net profit for a business is calculated using the formula Total Sales less (Cost of Goods + Expenses). A financial planning system will enable senior executives to ask what-if questions and adjust the values for total sales, the cost of goods, etc. to see the effect of the decision and on the net profit and find the most optimal way.
- **Bank loan management systems:** it is used to verify the credit of the loan applicant and predict the likelihood of the loan being recovered.

1.4. Compare between Transaction Processing System, Management Information System, and Decision support system

Base on (guru99), the table will show what is the difference between types for business decision making:

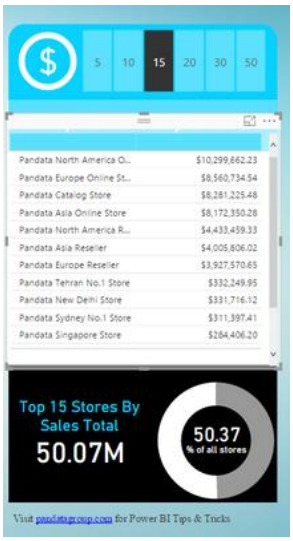
	Transaction processing system	Management information system	Decision support system
Used	Operational Management Level (lowest level), Low-level Managers (such as Team leader, Head manager)	Tactical Management Level (middle level), Middle-level Managers (such as CEO, CTO, Software Architect)	Strategic Management Level (highest level), Senior Level Managers (such as board directors
Data input	Daily records of the organization	The output from Transaction Processing System	The output from Transaction Processing System and Management Information System
Data output	Reports of daily transactions	Reports of current business activities within the organization	Reports of business activities within the organization and compared to other organizations
Usage	Help low-level managers to make decisions on changing how processes within the organization's operational processes should operate	Help middle-level managers to acknowledge how the organization has been working and its results	Help senior-level managers to make the decision on changing the organization's operational processes based on suggestions and statistics analysis

Table 2. Compare between types for business decision making

2. The key features of business intelligence functionality.

2.1. Ranking report

Ranking reports let you easily view the best- and worst-performing facets of your business, from products to marketing campaigns to salespeople. You can view rankings across multiple dimensions and specify various criteria to focus your results.



Picture 1. Ranking report. (powerbi)

This report creates variable rankings, across multiple dimensions, while specifying various selection criteria at run-time. For example, suppose you want a report that lists your top 25 best customers of the last year. Or, suppose you want the top (or bottom) 5 salespeople last month. A ranking report makes this simple.

An essential business Intelligence application, a ranking report lets the company quickly see the best and worst of any aspect of your business.

Rank	Country	Price	Quantity Shipping	Cost	Extended Sales	Extended Cost	Extended Profit
1	United States	1,164,645.35	328,260	859,599.86	15,778,700.85	11,659,753.44	4,118,947.41
2	Australia	262,285.45	67,529	193,421.70	3,521,864.35	2,603,768.03	918,096.32
3	India	169,771.25	48,122	126,100.72	2,360,482.80	1,758,823.12	601,659.68
4	Canada	159,737.15	40,114	118,248.02	2,238,283.65	1,661,689.61	576,594.04
5	Brazil	145,106.25	44,536	106,183.92	1,974,909.75	1,447,198.65	527,711.10
6	South Africa	136,310.70	38,694	100,546.67	1,880,678.70	1,387,618.29	493,060.41
7	Denmark	111,263.85	29,645	82,027.15	1,497,836.35	1,100,623.10	397,213.25
8	Argentina	102,821.45	30,202	76,421.66	1,409,651.25	1,047,157.97	362,493.28
9	Korea	97,546.75	26,864	72,093.45	1,326,839.70	982,981.54	343,858.16
10	Spain	91,780.00	22,310	67,933.17	1,266,580.65	939,341.05	327,239.60

Picture 2., Ranking report in BI. (crazybikes)

2.2. What-If analysis

If you're curious about how a future decision will affect your business, you can run a "**what-if**" analysis using past data to predict the potential impacts. Tools for what-if analyses give you an objective view of the risks and rewards involved in each potential decision and allow you to plan better for the future.

This application lets you assess potential business changes before you make them. Using past data, it displays how different changes might affect certain aspects of your business. For example, what if you raised prices by 10%? What if you lower prices and increased quantity? How would that affect sales?

A valuable BI application, the what-if analysis application lets you assess risks and rewards before making a decision.

Picture 3. What-If analysis

2.3. Executive Dashboards

Executive dashboards give your organization's leaders a real-time overview of your business in the form of graphs, charts, summaries, and other information reports. They allow your company's executives to make smarter, faster and better decisions.

A dashboard provides a real-time view of business using multiple,easy-to-read graphs. Dashboards offer essential data customized to each executive's duties and areas interest.

For example, a CEO needs graphs displaying revenue over the past year, month, and week. The customer service manager needs graphs displaying the average time needed to resolve issues.

Dashboards give your executives a real-time view of your business and alert the company to problems before they get out of hand.

Picture 4. Dashboards in BI

2.4. Interactive Reports

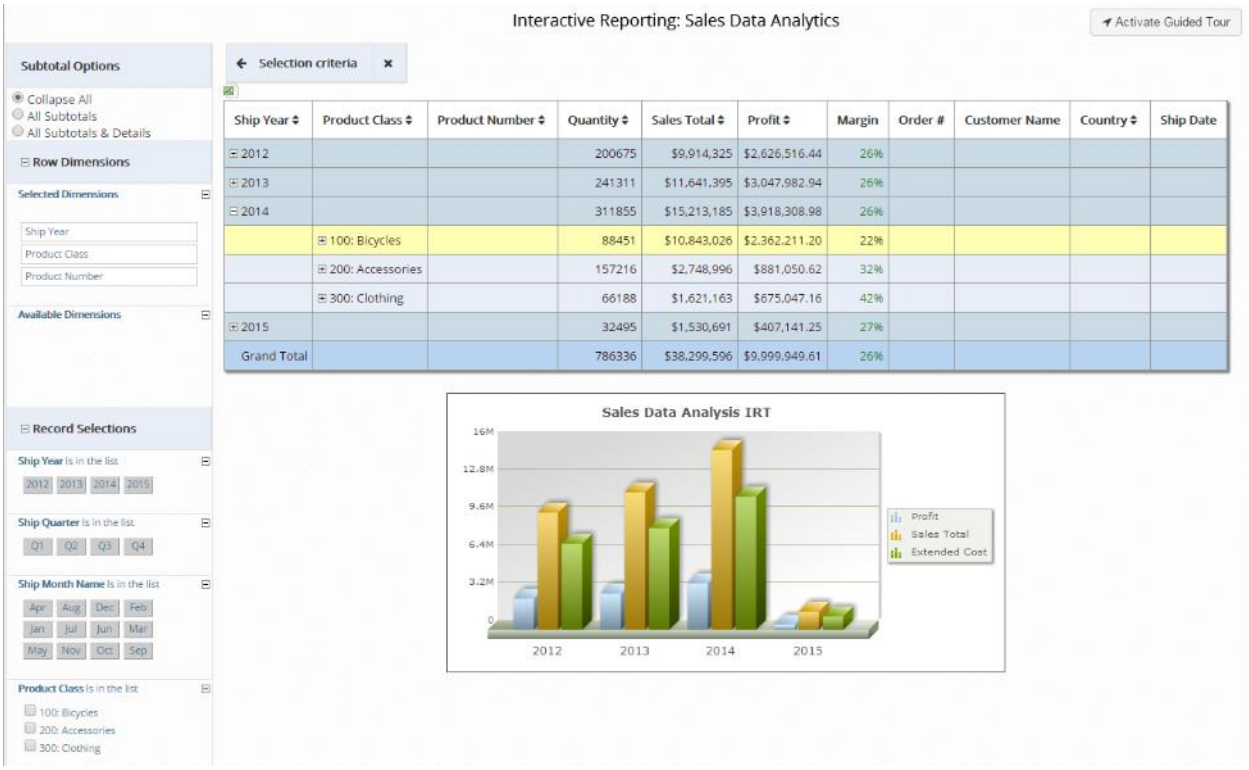
Interactive reports allow users to condense the massive amounts of collected data into a wide variety of possible views. Users can take advantage of features like statistical analysis and regression to identify trends, anomalies, and outliers in the data.

Interactive reports help users convert data into knowledge. They allow users to better understand the analysis within reports, and the underlying data those reports are based on, to support better decision-making. User should be able to:

- Drill down and through reports
- Conduct slice and dice OLAP analysis
- Apply analysis such as moving averages and regression to highlight trends in data
- Use time-series zooming to scan large data sets to understand anomalies in their data
- Use conditional formatting to set data alerts which highlight data exceptions

An extremely flexible BI application, the interactive report offers instant access to a wide range of business data in one place. It starts with a high-level view of the data and lets users drill down to the smallest details.

The interactive report allows view data in any way imaginable. It combines power, ease of use, and flexibility into one intuitive application.



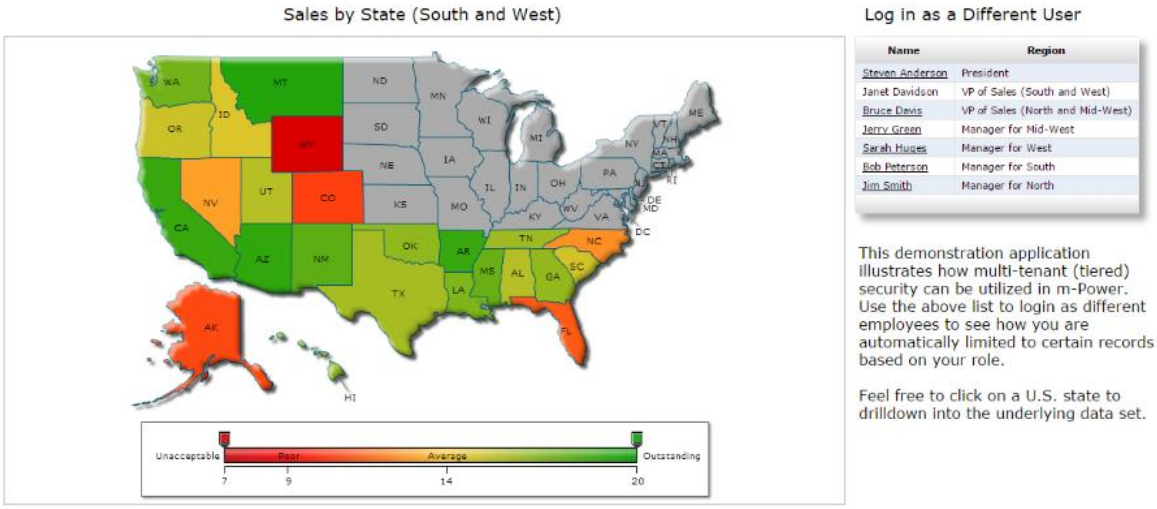
Picture 5. Interactive Reports

2.5. Geospatial Mapping

Applications using location intelligence can take your information and transform it into graphical and cartographic representations, simplifying your geographical data. At a glance, judging which regions are performing better than others and which ones need particular attention becomes much easier.

This application takes your geographical data and displays it graphically on a map. It helps businesses gain location-based insight--either to gain a competitive edge, improve organizational performance management or both.

Geospatial applications simplify geographical data. Rather than sorting through tables of data, decision-makers can quickly understand their data at a glance. For instance, the image below highlights the advantages of geospatial applications. With a glance at the map, a business leader can instantly see which sales regions are performing well, and which need help.



Picture 6. Geospatial mapping

2.6. Operational Reports

At the end of each day, business intelligence features like these can provide your organization's executives with a detailed summary of the daily events, giving them the information they need to make critical decisions.

Operational reporting is designed to support the detailed day-to-day activities of the organization. Often scheduled to run nightly and delivered via email, operational reports give business leaders the details they need to run the business.

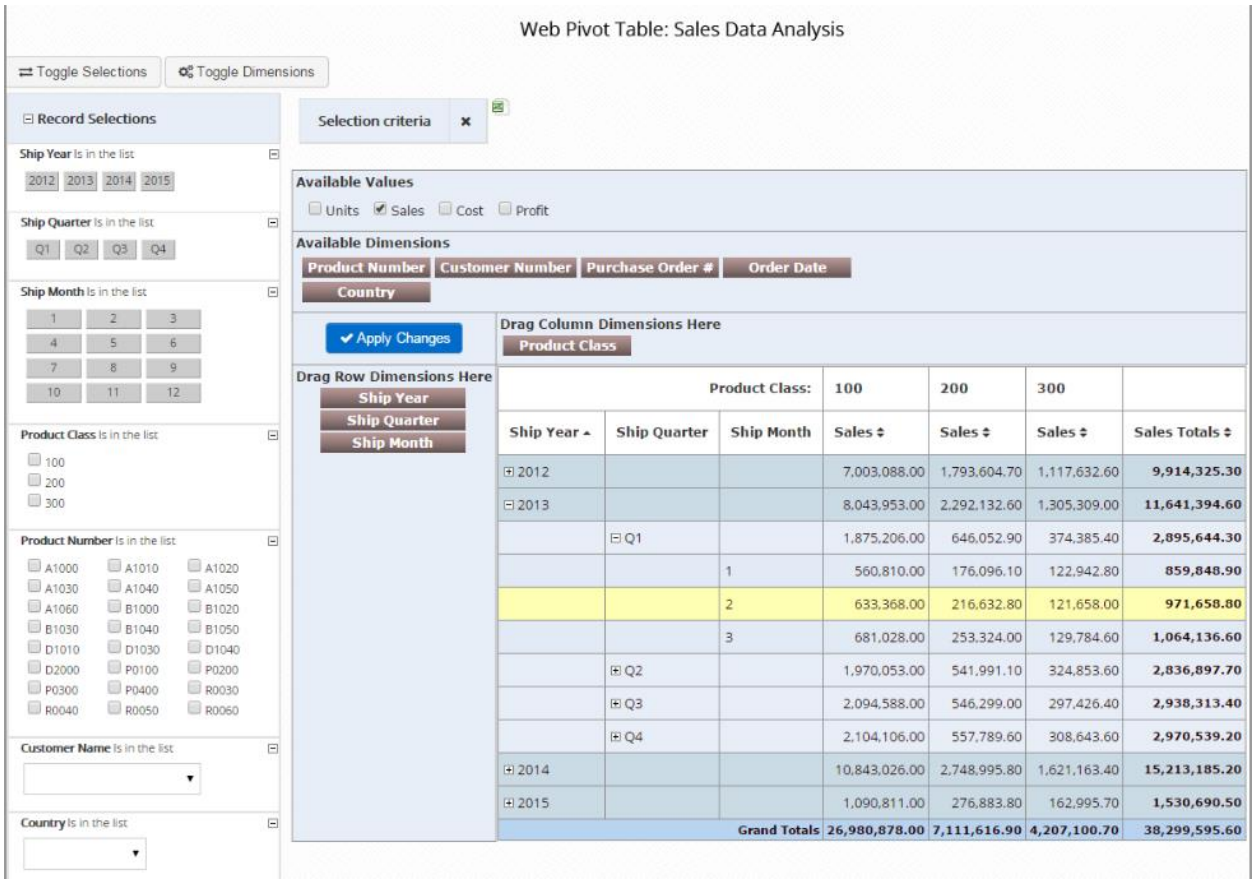
A good BI Platform should provide multiple reporting options (**ad-hoc**, **operational**, **what-if**, **mobile**, **dashboards**, etc.) from one codebase. The problem: Many vendors don't provide operational reporting capabilities as an out-of-the-box feature. This forces you to purchase and integrate multiple tools or purchase additional modules raising the TCO of your solution.

2.7. Pivot Tables

Pivot tables can automatically extract significant features from a large, messy set of data. They can perform calculations such as sorting, counting or averaging the data stored in one table and show the summarized results in another table. Pivot tables are essential tools for analyzing information and uncovering hidden trends.

Pivot tables automatically extract, organize, and summarize data. Often used for analyzing data, making comparisons, and discovering trends, the flexibility offered by pivot tables makes them one of the most popular BI applications.

Pivot tables help you spot hidden details and trends in a sea of data. One pivot table lets you quickly examine nearly any aspect of your data.



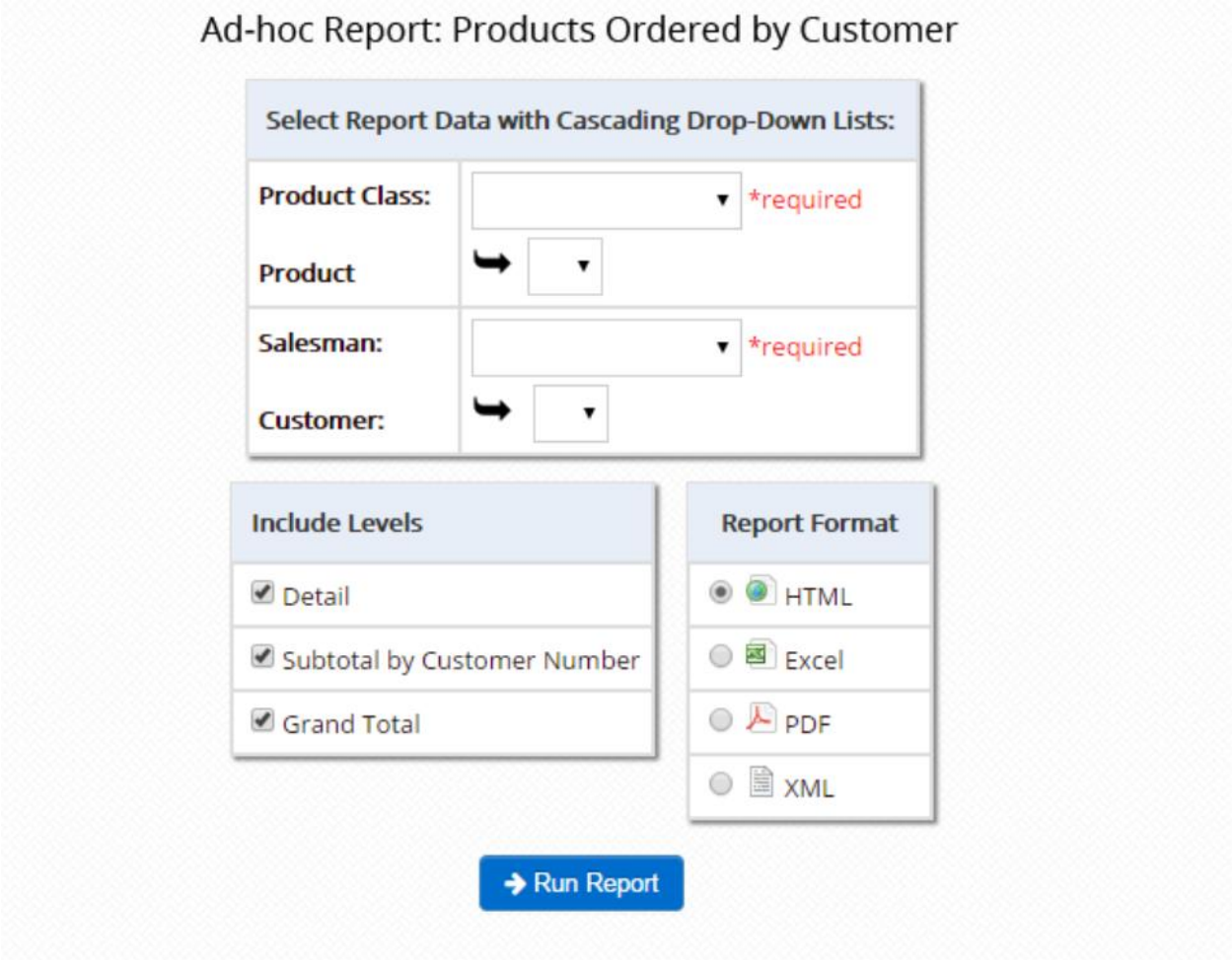
Picture 7. Pivot tables

2.8. Ad-hoc Reports

Instead of burdening your IT department with requests for detailed reports, ad-hoc reports are one of several important features of BI that let your nontechnical end-users generate their own reports on the fly. Users can pick and choose the elements that they wish to be included in the report, emphasizing only those aspects that are relevant to their query.

Ad-hoc reports let end-users create and distribute reports on the fly. Users select the data elements they wish to see in the report at run-time, and then export the report into a format of their choosing or email the report to other users directly from the web browser.

Ad-hoc reporting brings simple reporting capabilities to the users. It lets users create and run their own reports when they need them, taking the reporting burden off of the IT department.



Picture 8. Ad-hoc report

2.9. Open integration

Smart BI platforms will be able to access not only your organization's own data but information from email, social media, websites and more. For example, instead of only providing your internal sales data, your BI platform could accompany that information with reviews and comments about your products.

With so many data formats and so many applications to pull from, it's important that your BI platform is able to integrate as many different types of data as possible under a single roof, seamlessly combining disparate forms of information into an actionable report.

Match up these critical BI software features within your BI requirements template to ensure you are researching and selecting the ideal BI platform for your organization

In the future, BI applications will pull data from your database, cloud services, email accounts, social media, the web, and more. For instance, Business Intelligence applications will not only display product sales but also scan the web and social media sites for reviews and comments about your products.

Scanning the web helps the company understand your data on a new level. For instance, if sales fall dramatically on one day, the product feedback pulled from the web and social media may help you understand why.

3. The range of information systems and technologies that can be used to support organizations at operational, tactical and strategic levels.

3.1. Transaction Processing Systems

Transaction Processing System is operational-level systems at the bottom of the pyramid. They are usually operated directly by shop floor workers or front line staff, which provide the key data required to support the management of operations. This data is usually obtained through the automated or semi-automated tracking of low-level activities and basic transactions.

In this level of management, Transaction Processing Systems (TPS) are used to record day to day business transactions of the organization, therefore supporting the business operating activities or transactions. A computer-based TPS focuses on the operating level of business and deals mostly with data from internal sources.

TPS is ultimately little more than simple data processing systems.

Inputs	Processing	Outputs
Transactions Events	Validation Sorting Listing Merging Updating Calculation	Lists Detail reports Action reports Summary report

Table 3. Functions of a TPS

Some examples of transaction processing systems:

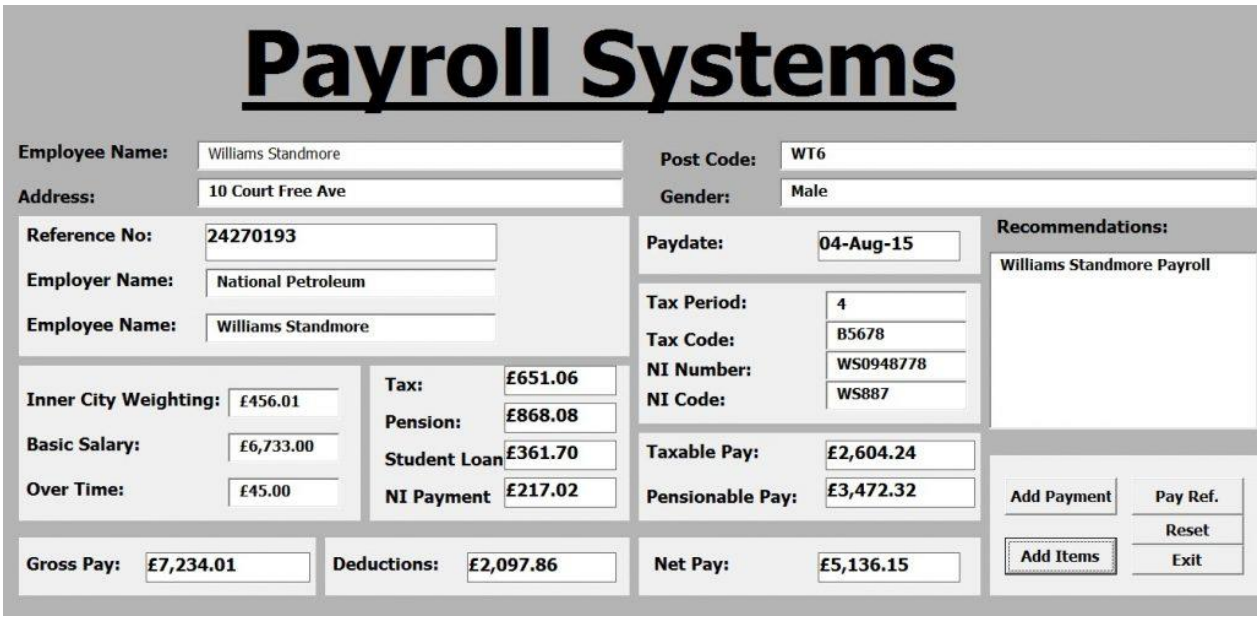
- **Order processing systems**: Stock control systems keeping track of inventory levels
- **Reservation systems**: Airline booking systems like flights booking management
- **Systems for payments and funds transfer**
- **Point of Sale Systems**: records daily sales
- **Payroll systems**: processing employees salary, loan management, etc.

A payroll system is a software designed to organize all the tasks of employee payment and the filing of employee taxes. These tasks can include keeping track of hours, calculating wages, withholding taxes and deductions, printing and delivering checks, completing the direct deposit, paying premiums to insurance carriers, and paying employment taxes to the government.

Payroll software assists with compensating employees for time worked. This software can be purchased through an HR software vendor or can be included as part of an HR software package as a module within a comprehensive system.

Basically, payroll software helps with calculating paychecks from hours logged in time and attendance tracking systems. The software then draws paychecks or direct deposits funds into employees' accounts. Taxes and deductions are also calculated and withheld by payroll programs.

Payroll software often requires very little input from the employer. The employer is required to input employee wage information and hours, then the software uses the information to perform calculations and deduct withholdings automatically. Most payroll software is automatically updated whenever a tax law changes and will remind employers when to file various tax forms. (hrpayrollsystems)



Picture 9. Payroll Systems.

3.2. Management Information Systems

For historical reasons, many of the different types of Information Systems found in commercial organizations are referred to as "Management Information Systems". However, within our pyramid model, Management Information Systems are management-level systems that are used by middle managers to help ensure the smooth running of the organization in the short to medium term. The highly structured information provided by these systems allows managers to evaluate an organization's performance by comparing current with previous outputs.

In this level of management, Management Information System (MIS) is used by tactical managers to monitor the organization's current performance status. The output from a Transaction Processing System (TPS) (discussed earlier) is used as input to an MIS.

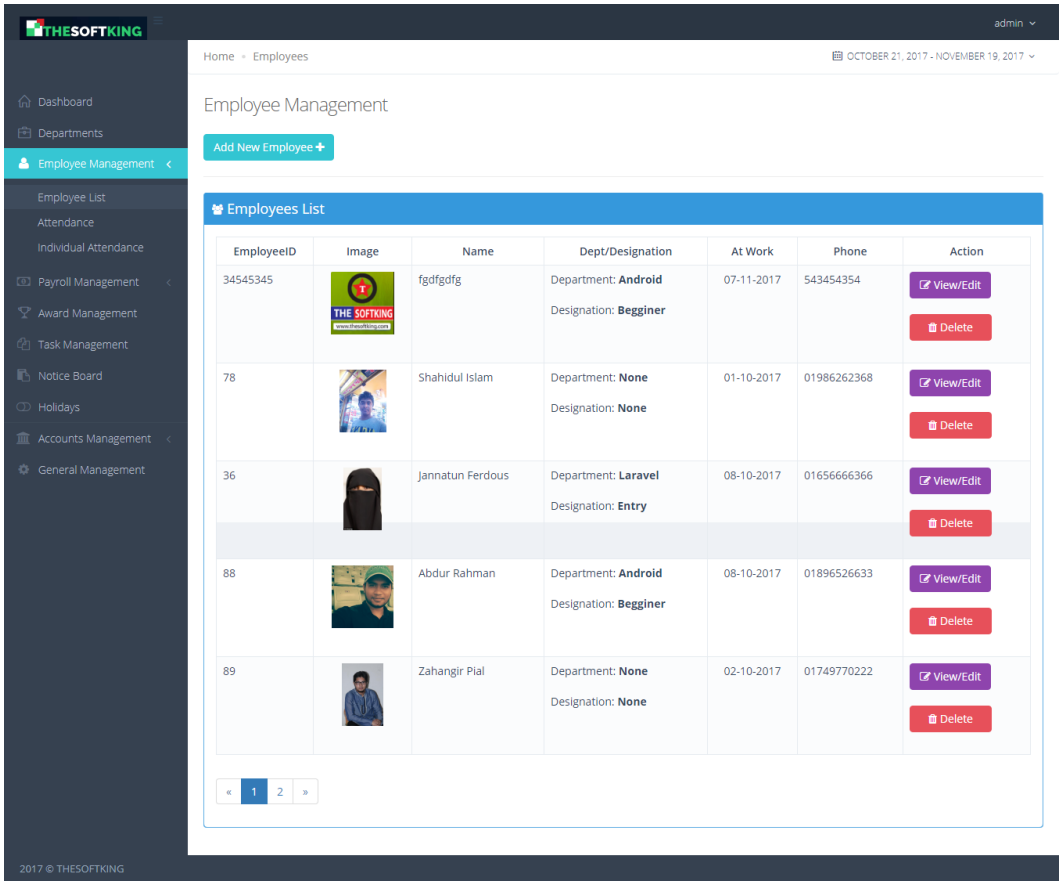
MIS is built on the data provided by the TPS:

Inputs	Processing	Outputs
Internal Transactions Internal Files Structured data	Sorting Merging Summarizing	Summary report Action reports Detailed reports

Table 4. Functions of an MIS

Examples of management information systems include:

- **Sales management systems**: they get input from the point of sale system
- **Budgeting systems:** gives an overview of how much money is spent within the organization for the short and long terms.
- **Human resource management system:** overall welfare of the employees, staff turnover, etc.



Picture 10. Example human resource management system

3.3. Decision Support Systems

A Decision Support System can be seen as a knowledge-based system, used by senior managers, which facilitates the creation of knowledge and allow its integration into the organization. These systems are often used to analyze existing structured information and allow managers to project the potential effects of their decisions into the future. Such systems are usually interactive and are used to solve ill-structured problems. They offer access to databases, analytical tools, allow "what if" simulations, and may support the exchange of information within the organization.

In this level of management, Decision Support System (DSS) are used by senior manager to emphasize flexibility in decision making, as well as to analyze unexpected problems and integrate information flow and decision-making activities and to make non-routine (unstructured) decisions, by using input from internal systems (database management systems, query languages, financial modeling, spreadsheet programs, statistical analysis programs, etc.), including TPSs and MISs, to external systems.

DSS manipulates and builds upon the information from an MIS and/or TPS to generate insights and new information.

Inputs	Processing	Outputs
Internal Transactions Internal Files External Information	Modeling Simulation Analysis Summarizing	Summary reports Forecasts Graphs / Plots

Table 5. Functions of a DSS

Examples of decision support systems include:

- **Financial planning systems**: it enables managers to evaluate alternative ways of achieving goals. The objective is to find the optimal way of achieving the goal. For example, the net profit for a business is calculated using the formula Total Sales less (Cost of Goods + Expenses). A financial planning system will enable senior executives to ask what-if questions and adjust the values for total sales, the cost of goods, etc. to see the effect of the decision and on the net profit and find the most optimal way.
- **Bank loan management systems:** it is used to verify the credit of the loan applicant and predict the likelihood of the loan being recovered.

3.4. Executive Information Systems

Executive Information Systems are strategic-level information systems that are found at the top of the Pyramid. They help executives and senior managers analyze the environment in which the organization operates, to identify long-term trends, and to plan appropriate courses of action. The information in such systems is often weakly structured and comes from both internal and external sources. Executive Information System is designed to be operated directly by executives without the need for intermediaries and easily tailored to the preferences of the individual using them.

EIS organizes and presents data and information from both external data sources and internal MIS or TPS in order to support and extend the inherent capabilities of senior executives.

Inputs	Processing	Outputs
External Data Internal Files Pre-defined models	Summarizing Simulation “Drilling Down:	Summary report Forecasts Graphs / Plots

Table 6. Functions of an EIS

Some examples of EIS: Executive Information Systems tend to be highly individualized and are often custom made for a particular client group; however, a number of off-the-shelf EIS packages do exist and many enterprise-level systems offer a customizable EIS module.

CONCLUSION

BI software connects people with information when and where they need it, and provides capabilities far beyond spreadsheets to deliver a true picture of the business. For small and mid-size firms, however, finding a BI strategy that matches their resources, expertise and budgets can be particularly challenging.

Organizations often start small with BI implementations by creating periodic reports or being reactive to enterprise events. That reporting is often based on historical data. However, moving past that is a real possibility.

Over time, organizations can move to use data to make predictive decisions. Big Data, mobile computing, internal data stores, and the cloud combine to create an environment in which “the sky is the limit” when it comes to using data to understand customers' perceptions as well as the general state of the business. Creating useful BI is a moving target that must adapt as available data and organizational needs change.

BI is not just the job of the IT department. It often starts that way, but it must grow. IT may focus on the storage, processing, and dissemination of BI, but for BI to be truly useful to the organization, IT must work alongside the business constituents who generate, understand and use the intelligence. BI is not just a tool of the IT department it may be enabled by technology, but it is a tool of business to enhance the understanding of the state of affairs

References

bigdataframework. (n.d.). *bigdataframework*. Retrieved from bigdataframework: https://www.bigdataframework.org/data-types-structured-vs-unstructured-data/

bigdataframework. (n.d.). *bigdataframework*. Retrieved from bigdataframework: https://www.bigdataframework.org/data-types-structured-vs-unstructured-data/

bigdataframework. (n.d.). *bigdataframework*. Retrieved from bigdataframework: https://www.bigdataframework.org/data-types-structured-vs-unstructured-data/

building-blocks. (n.d.). *building-blocksbuilding-blocks*. Retrieved from building-blocks: https://www.building-blocks.com/content/blogs/different-types-of-data-sources

businessprocessincubator. (n.d.). *businessprocessincubator*. Retrieved from businessprocessincubator: https://www.businessprocessincubator.com/content/what-are-support-processes/

businessstudynotes. (n.d.). *businessstudynotes*. Retrieved from businessstudynotes: https://www.businessstudynotes.com/hrm/managerial-decision-making-and-its-process/

crazybikes. (n.d.). *crazybikes*. Retrieved from crazybikes: https://www.crazybikes.com/mrc/CRAZYBIKES.R00160s?run=1&S_COUNTRY=1&top10=10&cur_sort_col=EXTSALES&sort_typ=1

csp. (n.d.). *csp*. Retrieved from csp: https://online.csp.edu/blog/business/decision-making-process

dreamstime. (n.d.). *dreamstime*. Retrieved from dreamstime: https://www.dreamstime.com/strategic-decision-making-components-image128868184

flexrule. (n.d.). *flexrule*. Retrieved from flexrule: https://www.flexrule.com/archives/what-are-operational-decisions/

forbes. (n.d.). *forbes*. Retrieved from forbes: https://www.forbes.com/sites/bernardmarr/2019/10/18/whats-the-difference-between-structured-semi-structured-and-unstructured-data/#436034ac2b4d

geeksforgeeks. (n.d.). *geeksforgeeks*. Retrieved from geeksforgeeks: https://www.geeksforgeeks.org/what-is-semi-structured-data/

guru99. (n.d.). *guru99*. Retrieved from guru99: https://www.guru99.com/mis-types-information-system.html

heflo. (n.d.). *heflo*. Retrieved from heflo: https://www.heflo.com/blog/bpm/business-processes-definition/

hrpayrollsystems. (n.d.). *hrpayrollsystems*. Retrieved from hrpayrollsystems: https://www.hrpayrollsystems.net/payroll-systems/

ittoday. (n.d.). *ittoday*. Retrieved from ittoday: http://www.ittoday.info/ITPerformanceImprovement/Articles/2012-04Lehmann.html

kissflow. (n.d.). *kissflow*. Retrieved from kissflow: https://kissflow.com/bpm/business-process/

korefacts. (n.d.). *korefacts*. Retrieved from korefacts: http://www.korefacts.com/strategic-decision-making/

managementmania. (n.d.). *managementmania*. Retrieved from managementmania: https://managementmania.com/en/support-processes

marketing91. (n.d.). *marketing91*. Retrieved from marketing91: https://www.marketing91.com/strategic-decision-making/

oriresults. (n.d.). *oriresults*. Retrieved from oriresults: https://www.oriresults.com/articles/blog-posts/whats-hiding-in-your-unstructured-data/

oriresults. (n.d.). *oriresults*. Retrieved from oriresults: https://www.oriresults.com/articles/blog-posts/whats-hiding-in-your-unstructured-data/

powerbi. (n.d.). *powerbi*. Retrieved from powerbi: https://community.powerbi.com/t5/Data-Stories-Gallery/Retail-Analysis-Dynamic-Measure-amp-TopN-Selection/m-p/121080

researchgate. (n.d.). *researchgate*. Retrieved from researchgate: https://www.researchgate.net/figure/Managerial-Decision-Making-Process_fig5_314262104

searchbusinessanalytics. (n.d.). *searchbusinessanalytics*. Retrieved from searchbusinessanalytics: https://searchbusinessanalytics.techtarget.com/definition/unstructured-data

searchcio. (n.d.). *searchcio*. Retrieved from searchcio: https://searchcio.techtarget.com/definition/business-process

tutorialspoint. (n.d.). *tutorialspoint*. Retrieved from tutorialspoint: https://www.tutorialspoint.com/difference-between-structured-semi-structured-and-unstructured-

wikipedia. (n.d.). *wikipedia*. Retrieved from wikipedia: https://en.wikipedia.org/wiki/Strategic_management

wikipedia. (n.d.). *wikipedia*. Retrieved from wikipedia: https://en.wikipedia.org/wiki/Application_software