

FACTFILE: GCE PROFESSIONAL BUSINESS SERVICES

UNIT A2 1: IT SYSTEMS IN A BUSINESS



Learning Outcomes

Student should be able to:

- describe, analyse and evaluate different IT systems used by professional business services firms and their client business:
 - transaction processing systems (TPS);
 - customer relationship management systems (CRM);
 - management information systems (MIS);
 - performance management systems (PMS);



1. Management information system (MIS)

A Management information system (MIS) is a generic concept and it is not until it is created for a specific purpose that it becomes operable within a business context. MIS have a life cycle and at some stage they may have to be amended or removed from the business.

MIS are used to help businesses be more effective and efficient in strategic and operational activities. Their design is dependent on the aims and objectives of the business, departments, people using the system and the business's needs. MIS are used by employees to collect, store and circulate data. This data is analysed and used to help employees (managers) make decisions that affect the effectiveness and efficiency of future activities.

Definitions

'A management information system (MIS) is a set of systems and procedures that gather data from a range of sources, compile it and present it in a readable format.'

Ingram (2019)

'[Management information systems is the study of computers and computing in a business environment. Computer science focuses on the machine while information systems, or management information systems, focuses on how IT can support the strategy and operation of organizations.]'

The main characteristics of the management information system include:

- helps a business to deliver its strategic, operational, and tactical objectives;
- flexible and can be adapted to the changing needs of the organization;
- can be developed to use an integrated database and support a variety of functional areas;
- the data inputted and stored within a MIS should be relevant, accurate and reliable;
- the data inputted, stored and retrieved from a MIS should be timely, complete and secure;

The type of systems designed, implemented and

managed will vary from business to business as all businesses are unique as determined by their strategy, structure, system, staff, management style, culture (McKinsey, 2008) and their external environment (WEF, 2019).

Is the system to be used by one person for a business activity (for example, record the name and time a visitor enters and leaves a building) or are there many employees and external stakeholders involved in different MIS activities? The greater the complexity (links to other departments, customers, and suppliers) the more likely the need to connect systems (interrelated); (Burke at al., 2017;Laaper et al., 2020).

Data input

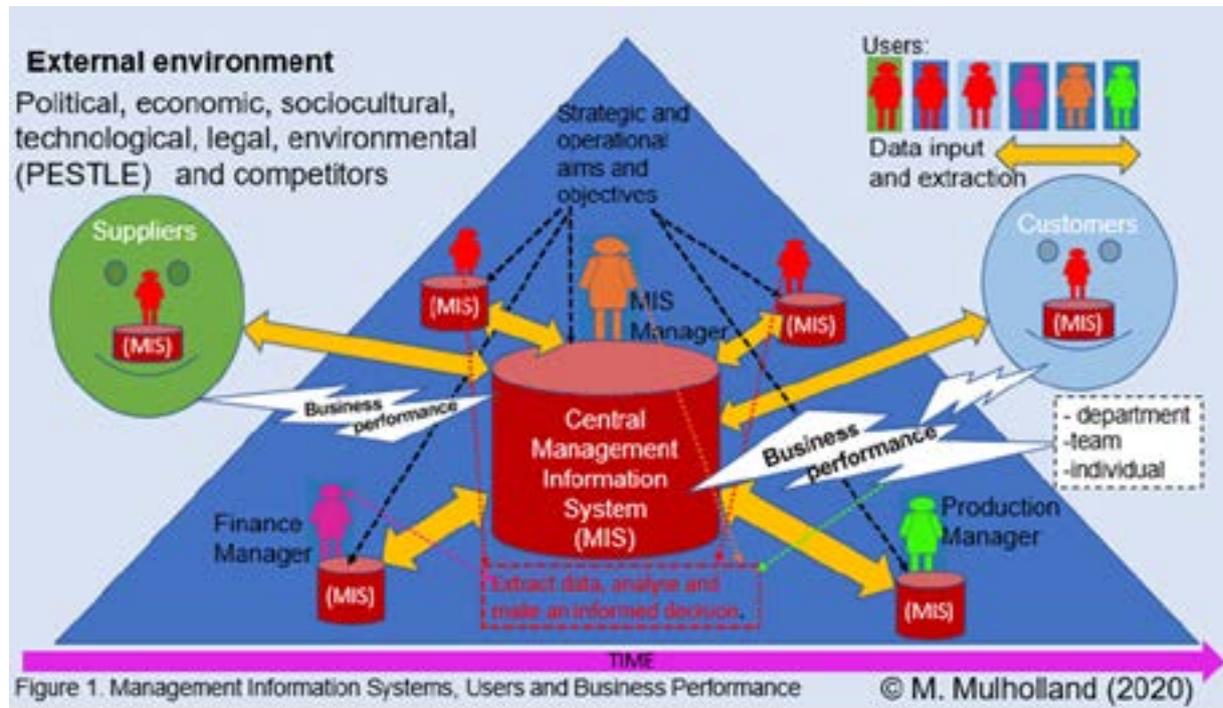
If a MIS is connected to other systems, each system must send the correct data, in an appropriate format and at the specified time (interdependent) e.g. if a manufacturing business needs to order goods from a supplier, the order system may entail data being inputted by several internal departments e.g. production, finance and procurement. The data (order) from

the procurement department will then be sent to the supplier. Within the supplier business data may flow through various MIS linked to their departments including marketing, finance, warehousing and distribution.

If incorrect data is entered, this can amplify mistakes and result in poor decision making.

Management information systems in context

Figure 1 *Management Systems and Users and Business Performance*, illustrates various aspects of a management information system. The internal MIS are linked to the Central MIS which is managed by the MIS Manager. The Finance Manager and the Production Manager manage their respective MIS and data is inputted to and retrieved from (denoted by the gold arrows) the main MIS in a timely manner. Likewise, in the external environment customers and suppliers operate their own MIS and can enter and retrieve data from the Central MIS of the business.



The quality of the data in terms of accuracy and timeliness will affect its value for the user (employee inputs data or employee extracts data). The effectiveness and efficiency of the MIS in Figure 1. will be dependent on accurate, reliable, and timely data being inputted correctly. It is implicit that all employees as well as suppliers and

customers have employees capable of inputting the correct data correctly at the appropriate time. Managers can then extract data to make more informed decisions that may positively affect competitiveness and performance of the business. Within the business, overall performance is influenced by the performance of departments,

teams and individuals and, externally by customers and suppliers.

MIS lifecycle

As time passes, attention needs to be paid to the lifecycle of a MIS. Changes in the external environment, PESTLE, suppliers and competitors, may result in changes to a business's strategic aims and objectives and its strategy. These business changes mean that MIS may need to be revised and amended to fit with the new or revised strategic and operational activities of the business.

Advantages of MIS

There are a number of ways that a business can benefit (Burke et al., 2017; Netsuite, 2019; Pratap, 2020; Visser et al., 2013) from having MIS including:

- process efficiency across the business - an integrated MIS reduces the number of times that the same data needs to be entered into the system e.g. customer sales data entries are transferred to the Finance department where an invoice is automatically issued to the customer. Simultaneously, distribution are informed that goods need to be transported to the customer.
- Reduced error rates - reducing the number of people inputting data automatically reduces the likelihood of wrong data being entered into the information system.
- Reliable and accurate information – improved quality of information allows managers to make more informed decisions leading to more effective and improved business performance.
- Employee productivity – with a MIS employees are able to cover work undertaken by staff in different departments meaning their output has increased but the time has remained the same.
- Cost savings –reducing the number of times data needs to be inputted means fewer staff are needed resulting in reduced staff costs.
- Greater management control – managers can monitor and review the position of activities, planned versus actual position and decide on changes needed to ensure objectives are met.
- Speed of response – as information flows more quickly, managers can access information faster and make informed decisions quicker. Earlier decision-making may then provide a competitive advantage and enable a faster response to opportunities in the marketplace.

Disadvantages of MIS

- Design cost - business must incur cost of using employees or consulting firm to design a MIS

- Building cost – business must pay for the implementation of the MIS
- Operating cost – business fund the running of the MIS
- Maintenance cost of the MIS – business must pay to maintain and modifying the system
- MIS operator training – cost of training employees and stakeholders.
- Incorrect data inputted – this means subsequent actions based on the data may be flawed.
- Incomplete data - will undermine any decisions based on this information available.
- Incorrect timing of data entry – will prevent information being available as planned.
- MIS user not trained to the appropriate level – without appropriate knowledge and skills at a specified level the user will not be able to use the MIS effectively.
- Cost of paying the MIS users - a business will have to pay employees to operate the MIS
- Security cost to protect the MIS – cost of software (firewall) to protect the MIS.

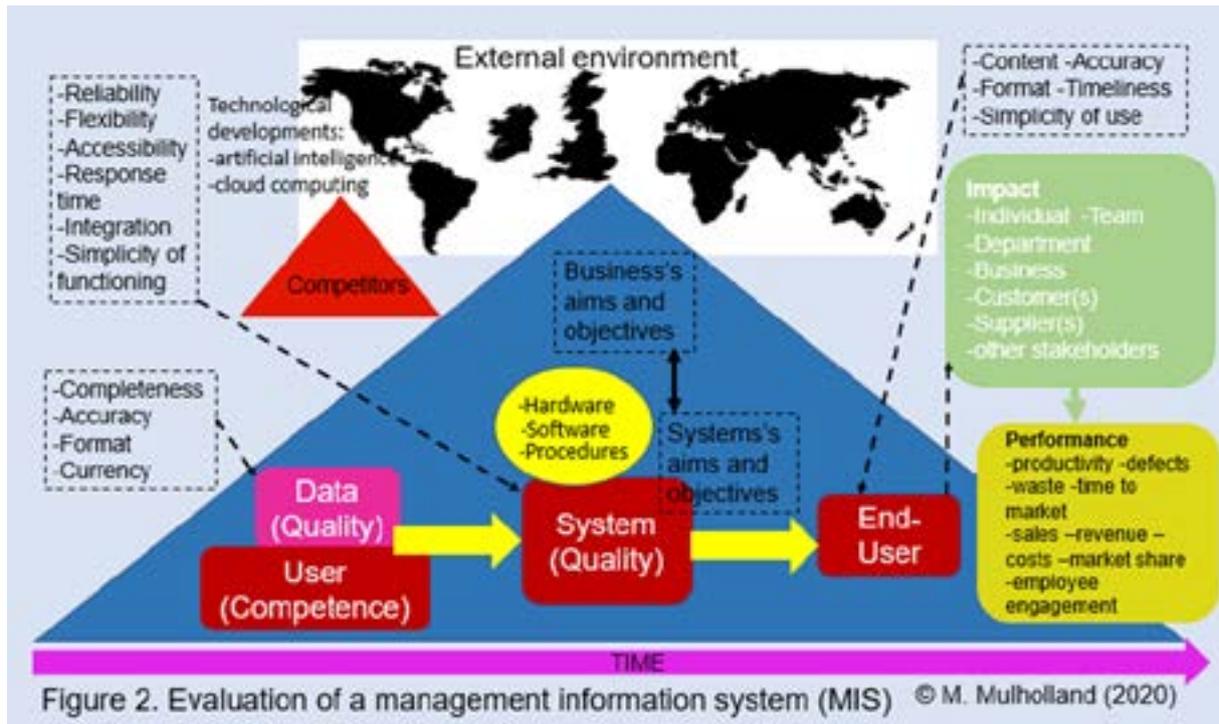
Evaluating a management information system

The evaluation of a MIS will, in part, be dependent on the context of the business (Avedillo et al., 2015; Deloitte, 2019; McKinsey, 2016; Petter et al., 2013). This context consists of:

1. The business's operating environment
2. It's strategic and operational aims and objectives.

The design, structure, data, and users influence the MIS's operational effectiveness and efficiency. Drucker (1963) notes that effectiveness is doing the right thing and efficiency is how well it is done. In relation to MIS effectiveness (Hamilton and Chervany, 1981) there must be optimum usage of resources employed to support the system. Generic criteria such as strategic and operational aims and objectives can be used to evaluate the effectiveness and efficiency of a MIS. The evaluation process must use relevant quantitative and qualitative information from a business's context (internal and external environment) to reach an informed judgement.

Figure 2, *Evaluation of a management information system*, illustrates the areas that relate to the evaluation of a business's MIS framework. The evaluation process determines how well stakeholders are served by the MIS. This framework can be used to evaluate performance management



systems (PMS), customer relationship management systems (CRM), transaction processing systems (TPS), and inventory management systems (IM).

Figure 2. shows a business, depicted by a blue triangle, within its external environment. Technological developments, customers, suppliers and competitors are external factors that can affect the business and its MIS. If there is a change in the business's external environment then the business may have to revise its strategic aims, objectives and strategic plan. This in turn may mean it has to change the aims and objectives of its MIS. The MIS requires data to be entered by a user, information contained within the system can be retrieved by the end user. Depending on how the extracted data is used it can have an impact on stakeholders e.g. teams, departments, customers, and suppliers. These stakeholders may then affect performance. The data (quality), system (quality) and end user can be assessed using various criteria contained within their respective boxes.

Three MIS areas, data (quality), system (quality) and end user will be evaluated using the stated criteria in Figure 2. and the final part of this evaluation will cover impact and performance.

Data (quality)

Completeness – has all the information that is needed for the system to operate effectively been entered into the system?

Accuracy – is the data entered into the system correct?

Format – is the information available to the user appropriately configured so that they understand, interpret, and enter the required data into the system?

Currency – how up to date is the information entered into the system?

System (quality)

Reliability – how dependable is the system over time (compare uptime to downtime or failures)?

Flexibility – can the system respond easily to changes in user requirements e.g. need data sooner and to changes in the operating environment e.g. increased sales so more data entered.

Accessibility – how easy (amount of effort) is it to extract information from the system?

Response time – how quickly can a system respond to a request for information?

Integration – does the system allow information to come from multiple sources so that it can be amalgamated to support decision-making?

Simplicity of functioning – is the system easy for the user to operate (users usually need a high level of competence)?

End user

Content – to what extent does the system give the end-user the information they require?

Accuracy – to what extent does the system give you the precise information you need?

Format – is the retrieved information in a configuration that can be used by the end-user?

Ease of use – how simple is the system to use for the extraction of information?

Timeliness – is the end-user able to extract information from the system at the required time and does the system offer the end-user current information?

Impact and performance

As noted in Figure 2 various stakeholders may be impacted by a business's MIS. The type and level of a system's impact on the stakeholder will be determined by the purpose of the system, its effectiveness, efficiency and the nature of the tasks to complete e.g. a revised MIS may enable sales employees immediate access to customer enquiries enabling a faster response. This competitive advantage may result in a growth in sales, and subsequent increases in employee productivity, market share and longer-term profits.

In conclusion, the evaluation of a MIS is largely conducted through the following:

- A comparison of the purpose and objectives of a system against agreed outputs
- Assessment of data (quality), system (quality) end-user
- Variance analysis comparing planned performance against actual performance (Hamilton and Chervany, 1981) of impacted stakeholders.

Application of management information systems

It should be noted that the information contained in the previous sections regarding MIS, to a large extent, also relates to the remaining IT systems in this fact file. As noted earlier, the term MIS is generic and requires purpose and aims and objectives within a business context to make it relevant to the needs of the business. The following management information systems, performance management systems (PMS), customer relationship management systems (CRM), transaction processing systems (TPS), and inventory management systems (IM) are created to meet a stated business need. The design, structure, and operation of these systems will be influenced by the scale and scope (internal and external connections to other MIS) of the business and the resource (human, financial, physical, and time) requirements.

2. Performance management systems (PMS)

All PMS are unique as they are set within different business contexts. The purpose and structures of PMS are similar but each system possesses unique characteristics in terms of user capability, information quality, system architecture, and outputs.

Some organisations take an holistic view that PMS affect business-wide activities (Akhtar, 2018; de Waal, 2003) and their PMS is integrated throughout the business to ensure that human, financial, and physical resources are utilised to ensure aims are achieved.

Conversely, others regard PMS as being related to performance appraisal or performance management (Accenture, 2017; Chubb et al., 2011; CIPD, 2019; Sloan et al., 2017). The 'once a year' appraisal review meeting being replaced by more frequent reviews over the year and more people

inputting views. This increased frequency of reviews is due to the changing nature of work, the growth of millennials in employment, and technological developments. Digital technologies (Accenture, 2017) such as mobile applications are now being used to support the flows of real time data about employees (appraisees). Companies such as Accenture, (Sloan et al., 2017) use technology to support their PMS and the performance appraisal process. This data is stored in the cloud where a manager (appraiser) can access the relevant data and have an informed discussion with the employee about performance etc.

Definitions

Ferreira and Otley (2009, 264) regard 'PMSs as the evolving formal and informal processes, systems, and networks used for conveying key objectives..., for assisting ...ongoing management... managing

performance and for supporting and facilitating organisational learning and change’.

There are various advantages and disadvantages that are attributed to a PMS (Ashe-Edmunds, 2020; Martinez and Kennerley, 2006). These include:

Advantages

- reduction in administrative costs
- generates information that can be taken from multiple sources
- can be integrated with other systems
- information can be inputted remotely
- better quality of information
- real time information provided
- information can be retrieved remotely

Disadvantages

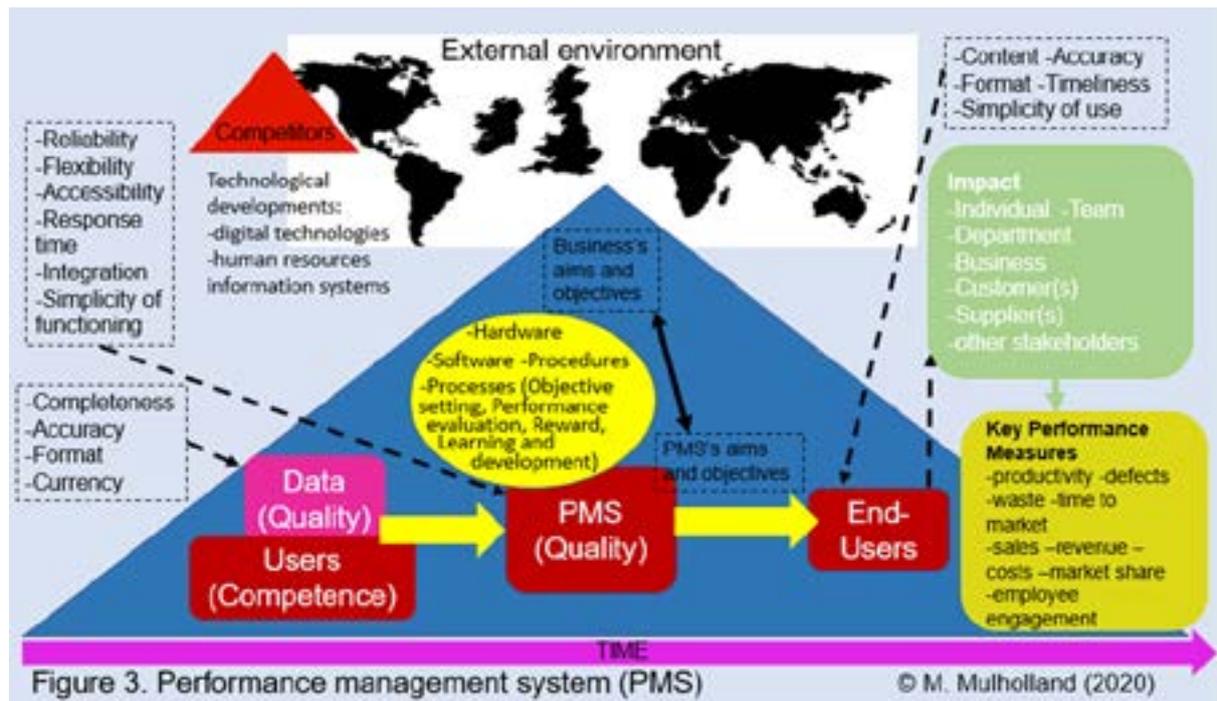
- cost involved in the design and build of the system
- it may not be feasible to integrate systems due to incompatibility
- training costs regarding PMS Users
- maintenance cost of the system
- security cost of protecting the system
- the data entered into the PMS may be incorrect or incomplete or in an inappropriate format
- the data may not be entered at the required time
- interruptions in energy supply can make the system inoperative
- technology underpinning the system may become obsolete

Figure 3, *Performance Management System*, illustrates how systems can support performance appraisal / performance management processes. As previously noted in the MIS section, the key features associated with Data (Quality), PMS (Quality) and End-Users are effectively the same for a PMS. The PMS, in this case, has Users who are the appraiser and the appraisee. Other Users may include appraisee colleagues, employees they manage, and senior colleagues (360° appraisal). The Users input data into the system and stored data can be accessed by the appraiser and appraisee.

The retrieved information can inform their discussions in the appraisal meeting. Areas to discuss could include objective setting, performance, reward, and learning and development. Depending on the agreed outcomes of the meeting, resulting decisions and information may then be stored and circulated through interconnected reward and learning and development systems. A key attribute of the PMS is that its aims and objectives are aligned with the aims and objectives of the business. If the PMS functions effectively, the End User’s (appraisee) performance should have improved which will have a impact on other colleagues or team members performance and positively influence key performance areas such as productivity and waste.

Evaluation of PMS

Three PMS areas, data (quality), system (quality), and end user can be evaluated using the stated



criteria in Figure 3. and the final part of this evaluation will include impact and performance. Refer to the evaluation coverage in the MIS section as this evaluation process can be employed here.

3. Customer relationship management systems (CRM)

Definition

CRM is the integration of technology with business processes to support and enhance the business - customer partnership (Baashar et al., 2020) through the collection, storage, and analysis of customer information and product / service delivery (Li et al., 2019).

The aims and objectives linked to a CRM should be aligned with the business's aims and marketing, production, and finance departments should subsequently all improve their performance. The CRM should give the business a competitive advantage (Sebjan et al., 2014) by understanding customers' needs faster and delivering products / services that meet and exceed their expectations.

CRM within the business

The development and implementation of a CRM requires the business to have a vision of its future, how the CRM fits within the business and how the system will enable the business to reach its desired destination. The vision must be translated into a strategy with resources allocated to help design, develop, and implement the CRM e.g. use of apps that use a cloud-based solution and then maintain its effective operation. The objectives of the business and CRM need to align. All relevant CRM stakeholders e.g. employees, technology and partners, need to buy-in to its use and operation. The value of the CRM must be measurable. Stakeholders must be trained how to use the CRM and regular reviews of agreed metrics are needed to ensure the CRM delivers the desired return on investment (Salesforce, 2017).

Advantages

- reduction in administrative costs
- generates information that can be taken from multiple sources
- PMS can be integrated with other systems
- information can be inputted and retrieved remotely
- better quality and real time information
- improves the coordination of work among employees within the business
- the business has more knowledge about

the customer so can make more informed decisions

- marketing strategies more effectively integrated and related to the customer

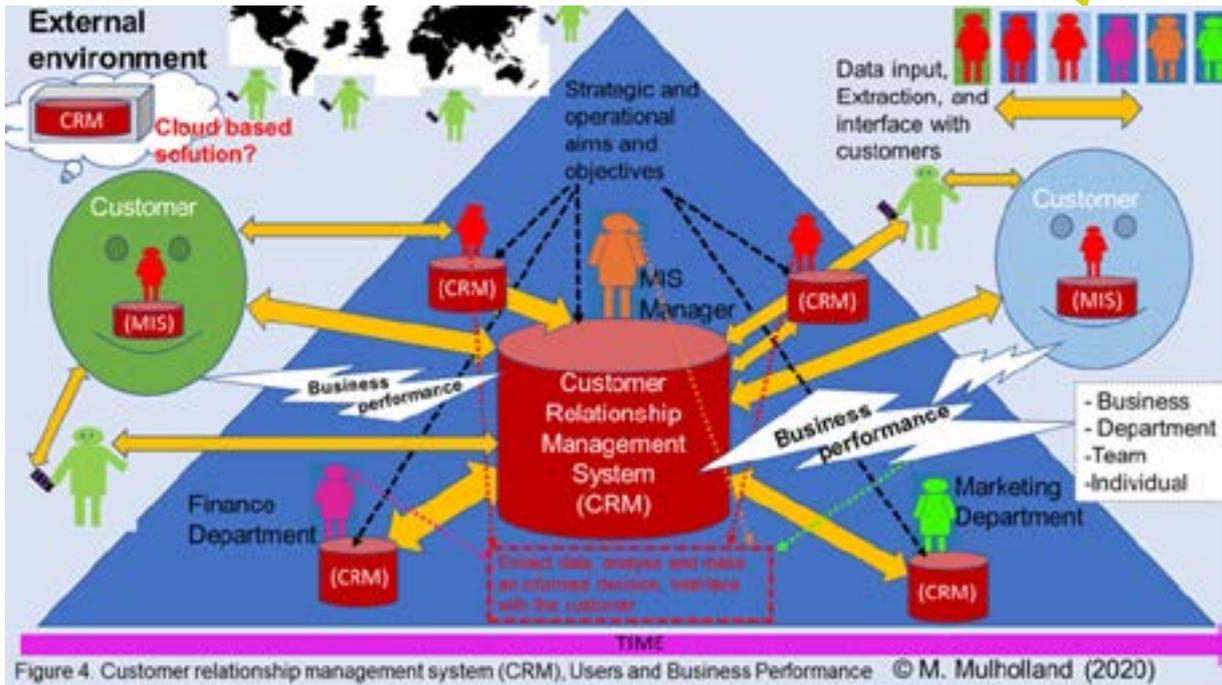
Disadvantages

- cost involved in the design, build, maintenance and security of protecting the system
- may not be feasible to integrate systems due to incompatibility
- training costs regarding CRM Users
- the data entered into the CRM may be incorrect, incomplete or in inappropriate format
- the data may not be entered at the required time
- cost of adhering to regulations (General Data Protection Regulations [GDPR])
- interruptions in energy supply can make the system inoperative
- technology underpinning the system may become obsolete.

Figure 4., 'Customer relationship management system (CRM), Users and Business Performance', depicts a CRM in action. It indicates that the CRM can be located in the business or be cloud-based. Different departments can access customer information, undertake analysis of customer data and make decisions. Digitally mobile employees, when away from the organisation can use a mobile phone to input and extract real-time data from the CRM, making the business more responsive to customer needs. Within the business there is a clear link between its aims and objectives and the CRM's. Finally, if used effectively and efficiently the CRM will have an impact on the business's, departments', teams', and individuals' performance. This may result in increased sales, higher levels of productivity, more satisfied customers, better utilisation of assets, and a positive return on the CRM investment

Evaluation

Three CRM areas, data (quality), system (quality), and end user can be evaluated using the stated criteria in Figure 2. and the final part of this

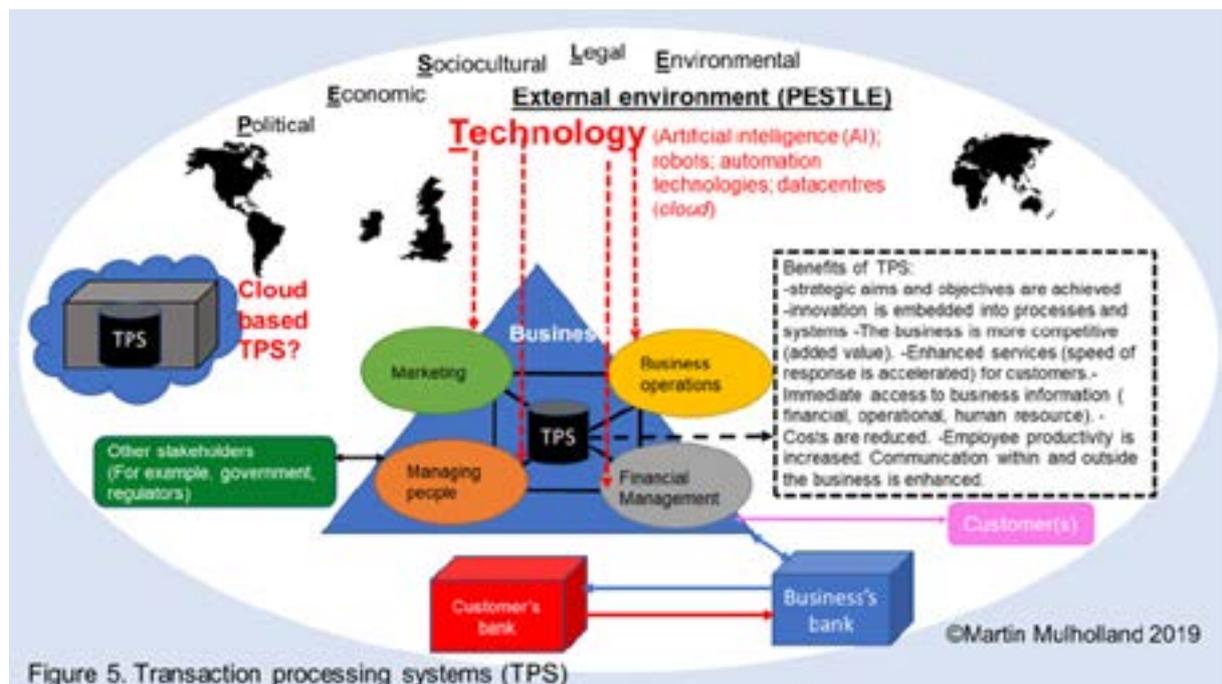


evaluation will include impact and performance. Refer to the evaluation coverage in the MIS section as this evaluation process can be employed here.

4. Transaction processing systems (TPS)

Transaction processing systems (TPS) enable a business to complete routine exchanges, money and information, with customers, suppliers, and distributors (Bocij et al., 2008). Examples of TPS include cash withdrawals from an auto-teller machine (ATM), paying for goods at a supermarket, and purchasing a good online.

Figure 5, *Transaction processing systems (TPS)* are enabling customers to interface with a business 24 hours per day, 7 days per week, and 365 days per annum. The benefits of a using TPS include: customers have immediate access to a business's products / services; goods can be purchased in real time; and innovation is embedded in the business.



Each business employs TPS to enhance their communications, financial management, business operations, and management of people. For example, an airline (British Airways, 2019; EasyJet, 2019; Flybe, 2019; Ryanair, 2019) may decide to use technology to enhance business operations so customers can book their seats on a plane through a TPS. The airline is now able to deal with a high volume of bookings without having to recruit, train, and pay additional employees (cost saving) to deal with booking requests from customers. This technology enables the customer to choose their outbound and inbound destinations or single journey and to choose on which day and at what time they desire to fly out. The customer can also add in additional services such as priority boarding, luggage, travel insurance, hire car, and hotels. At each touch point of this service the customer can see what price they will be charged.

Business operations (BO) can use TPS to substitute staff for technology. The benefits to BO are:

- customers have access to booking flights 24 / 7 / 365 from anywhere in the world
- management of airline logistics (flight bookings, airport slots booked, refuelling, cleaning, food and beverages) can all be analysed by operations staff and appropriate actions taken to ensure the right support and resources are available for each journey.
- staff costs reduced as customers input details on-line and complete financial transaction.

Financial management of the airline improves as the TPS results in monies being securely transferred from the customer's bank account to the airline. Foreign currency transactions, that is, flights booked using different currencies are converted (exchange rates) into a common currency. The airline's cash flows and cash balances are enhanced through these transactions which are in advance of service delivery. The airline may also be in a position to earn interest on income received from bookings that are well in advance of the customer's flight.

From a managing people perspective, the airline can identify the type and quantity of staff needed for each flight. During peak periods the airline can calculate how many additional staff may be required and from which countries they may need to be recruited.

TPS is an effective mechanism which enhances communication between the airline and the customer. The customer receives real time

information about flights and additional services being offered. The customer is also able to avail of a language translation option which may allow them to switch to viewing text in their own language which adds value to the service(s) being offered by the airline.

This technology reduces the airline's cost of having to recruit and deploy employees who speak at least two languages that are related to the country routes covered by the airline.

Advantages

- reduction in administrative costs
- TPS can be integrated with other systems
- purchases can be made remotely
- real time information provided to the company about the customer
- improves the coordination of work among employees within the business
- the business has more knowledge about the customer
- more informed decisions can be made about the customer based upon an analysis of their purchasing patterns
- marketing strategies, plans, and promotions can be more effectively integrated and related to the customer(s)

Disadvantages

- cost involved in the design and build of the system
- it may not be feasible to integrate systems due to incompatibility
- training costs regarding TPS Users (within the business)
- maintenance and security cost of protecting the system
- the data entered into the TPS may be incorrect, incomplete or in an inappropriate format
- cost of adhering to regulations (General Data Protection Regulations [GDPR])
- interruptions in energy supply can make the system inoperative
- technology underpinning the system may become obsolete.

Evaluation

Three TPS areas, data (quality), system (quality), and end user can be evaluated using the stated criteria in Figure 2. Refer to the evaluation coverage in the MIS section as this evaluation process can be employed here.

An inventory management systems (IM) helps the business to manage stock levels by recording when stock is used in the production process or as sales. When stock levels reach a minimum point, reorder point (ROP), the system will automatically place an order for stock to be replenished (Bocij et al., 2008).

Key features of IM

- Enables product categorisation, inventory to be checked and ecommerce to be supported.
- Barcodes or RFID tags can be added to products to reduce human error when processing orders and allows products to be located.
- Improves communication as the customer can track their order in transit.
- Forecasting is enhanced as sales levels of categorised products can be analysed.
- Automatic alerts when stock levels are low.
- Inventory security can be enhanced by firewalls and adherence to security protocols.
- Cloud-based software provides the business with real-time updates via an inventory app.
- Can be integrated with other systems.

Advantages

- Reduction in administrative costs.
- Can be integrated with other systems.
- real time information provided to the company about the customer.

- Improves the coordination of work among employees within the business.
- Informed decisions can be made about stock category levels via analysis of ordering pattern.

Disadvantages

- Cost involved in the design and build of the system.
- May not be feasible to integrate systems due to incompatibility.
- Training costs regarding IM Users (within the business).
- Maintenance and security cost of the system.
- Data entered into the IM may be incorrect, incomplete or in an inappropriate format.
- Interruptions in energy supply can make the system inoperative.
- Technology underpinning the system may become obsolete.

Evaluation

Three TPS areas, data (quality), system (quality), and end user can be evaluated using the stated criteria in Figure 2. Refer to the evaluation coverage in the MIS section as this evaluation process can be employed here.

References

- Accenture (2017) Performance Achievement. Available at: https://www.accenture.com/t20180529T062404Z__w_/us-en/_acnmedia/PDF-50/Accenture-Performance-Achievement-Credential-Web.pdf [Accessed on 22 May 2018].
- Akhtar, M. (2018) Strategic performance management system in uncertain business environment - An empirical study of the Indian oil industry. *Business Process Management Journal*, Vol. 24 No. 4, 2018 pp. 923-942. DOI 10.1108/BPMJ-05-2017-0102.
- Ashe-Edmunds, S. (2020) Advantages & Disadvantages of Electronic Performance Appraisals. Accessed on 21 January 2020. [Available at: <https://work.chron.com/advantages-disadvantages-electronic-performance-appraisals-20351.html>].
- Avedillo, J.G., Begonha, D., and Peyracchia, A. (2015) Two ways to modernize IT systems for the digital era. McKinsey & Company. Available at: <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Two%20ways%20to%20modernize%20IT%20systems%20for%20the%20digital%20era/Two%20ways%20to%20modernize%20IT%20systems%20for%20the%20digital%20era.ashx> [Accessed on 24 December 2019].
- Baashar, Y., Alhussain, H., Patel, A., Alkaws, Alzahrani, A.I., Alfarraj, O., and Hayder, G. (2020) Customer relationship management systems (CRMS) in the healthcare environment: A systematic literature review. *Computer Standards & Interfaces*, 71. doi.org/10.1016/j.csi.2020.103442 Received 7 December 2019; Received in revised
- Becker, K., Antuar, N., and Everett, C. (2011) Implementing an Employee Performance Management System in a Nonprofit Organization. *NONPROFIT MANAGEMENT & LEADERSHIP*, vol. 21, no. 3, Spring, pp. 255 to 271. DOI: 10.1002/nml.20024
- Bocij, P., Greasley, A. and Hickie, S. (2008) *Business Information Systems*. 4th ed. Pearson Education Limited.
- Bocij, P., Greasley, A., and Hickie, S. (2008) *Business Information Systems*. 4th ed., Prentice Hall.
- Bradley, R.V., Pridmore, J.L., and Byrd, T.A. (2006) Information Systems Success in the Context of Different Corporate Cultural Types: An Empirical Investigation, *Journal of Management Information Systems*, 23:2, 267-294, DOI: 10.2753/MIS0742-1222230211
- Broadbent, J. and Laughlin, R. (2009) Performance management systems: A conceptual model. *Management Accounting Research*, 20, pp. 283–295. doi:10.1016/j.mar.2009.07.004.
- Brookins, A. (no date) Examples of Just-in-Time Inventory. *Smallbusiness.chron*. Available at: <https://smallbusiness.chron.com/examples-justintime-inventory-11970.html> [Accessed on 31 October 2019].
- Burke, R., Laaper, S., and Mussomeli, A. (2017) The smart factory - Responsive, adaptive, connected manufacturing. Deloitte Insights. Available at: <https://www2.deloitte.com/us/en/insights/focus/industry-4-0/smart-factory-connected-manufacturing.html> [Accessed on 21 May 2019].
- Chubb, C., Reilly, P., and Brown, D. (2011) Performance Management. Literature Review. Institute for Employment Studies. Available at: <https://www.employment-studies.co.uk/system/files/resources/files/mp90.pdf> [Accessed on 03 June 2014].
- CIPD (2019) Performance management: an introduction. Available at: <https://www.cipd.co.uk/knowledge/fundamentals/people/performance/factsheet> [Accessed on 22 January 2020].
- Daub, M. and Wiesinger, A. (2015) Acquiring the capabilities you need to go digital. McKinsey & Company. Available at: https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Acquiring%20the%20capabilities%20you%20need%20to%20go%20digital/Acquiring_the_capabilities_you_need_to_go_digital.ashx [Accessed on 24 December 2019].
- Deloitte (2015) Do you have a clear vision of your human resources? <https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/human-capital/lu-en-educosvision.pdf> [Accessed on 21 May 2018].
- Deloitte (2019) Enterprise Technology & Performance Unlocking value from technology. Available at: <https://www2.deloitte.com/global/en/pages/technology/solutions/technology-services.html> [Accessed on 21 January 2020].
- Delone, W.H. and McLean, E.R. (2003) *The DeLone and McLean*

Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19:4, 9-30, DOI: 10.1080/07421222.2003.11045748 To link to this article: <https://doi.org/10.1080/07421222.2003.11045748>

Den Hartog, D.N., Boselie, P., and Paauwe, J. (2004) Performance Management: A Model and Research Agenda. *APPLIED PSYCHOLOGY: AN INTERNATIONAL REVIEW*, 2004, 53, (4), 556 –569.

Desmet, D., Löffler, M. and Wenberg, A. (2016) Modernizing IT for a digital era. McKinsey & Company. Available at: <https://www.mckinsey.com/~media/McKinsey/Industries/Technology%20Media%20and%20Telecommunications/High%20Tech/Our%20Insights/Modernizing%20IT%20for%20a%20digital%20era/Modernizing-IT-for-a-digital-era.ashx>[Accessed on 24 December 2019].

De Waal, A.A., (2003) Behavioral factors important for the successful implementation and use of performance management systems. *Management Decision*, 41/8, pp. 688 to 697. DOI.10.1108/00251740310496206.

De Waal, A., Kourit, K., and Nijkamo, P. (2009) The relationship between the level of completeness of a strategic performance management system and perceived advantages and disadvantages. *International Journal of Operations & Production Management* Vol. 29 No. 12, pp. 1242-1265. DOI 10.1108/01443570911005983.

Drucker, P.F. (1963) Managing for Business Effectiveness. *Harvard Business Review*. Available at <https://hbr.org/1963/05/managing-for-business-effectiveness> [Accessed on 22 June 2019].

Ferreira, A. and Otley, D. (2009) The design and use of performance management systems: An extended framework for analysis. *Management Accounting Research*, 20, pp.263–282. doi:10.1016/j.mar.2009.07.003.

Fiorini, P., Jabbour, C.J.C. (2017) Information systems and sustainable supply chain management towards a more sustainable society: Where we are and where we are going. *International Journal of Information Management*, 37, pp.241–249. <http://dx.doi.org/10.1016/j.ijinfomgt.2016.12.004>

Hamilton, S. and Chervany, N.L. (1981) Evaluating Information System Effectiveness --Part I: Comparing Evaluation Approaches. *MIS Quarterly*, September, pp. 55 – 69.

IfM (2020) JIT Just-in-Time manufacturing. Institute for Manufacturing. Available at: <https://www.ifm.eng.cam.ac.uk/research/dstools/jit-just-in-time-manufacturing/> [Accessed on 22 January 2020].

Ingram, D. (2019) What Is a Management Information System?

Smallbusiness.chron. Available at: <https://smallbusiness.chron.com/management-information-system-2104.html> [Accessed on 12 December 2019].

Kakhki, M.D. and Gargeya, V.B. (2019) Information systems for supply chain management: a systematic literature analysis. *International Journal of Production Research*, 57:15-16, 5318-5339, DOI: 10.1080/00207543.2019.1570376

Laaper, S., Cotteleer, M., Dollar, B., and Sniderman, B. (2020) Implementing the smart factory - New perspectives for driving value. *Deloitte Insights*. Available at: <https://www2.deloitte.com/us/en/insights/topics/digital-transformation/smart-factory-2-0-technology-initiatives.html> [Accessed on 02 April 2020].

LBTC (2019) How are Information Systems Transforming Business? Available at: <https://www.lbtc.co.uk/information-technology-blog/information-systems-transforming-business/> [Accessed on 23 October 2019].

Li, Y., Huang, J., and Song, T. (2019) Examining business value of customer relationship management systems: IT usage and two-stage model perspectives. *Information and Management*, 56. Pp. 392 – 402. <https://doi.org/10.1016/j.im.2018.07.012>

Martinez, V. and Kennerley, M. (2006) Performance Management. Available at: https://www.cimaglobal.com/Documents/ImportedDocuments/FM_Feb_06_Technical_matters_Perf_Mgmt.pdf [Accessed on 21 June 2010].

McKinsey (2008) Enduring Ideas: The 7-S Framework. McKinsey & Company. Available at: <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/enduring-ideas-the-7-s-framework> [Accessed on 23 May 2010].

McKinsey (2016) Partnering to shape the future— IT's new imperative. McKinsey & Company. Available at: <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20>

Insights/Partnering%20to%20shape%20the%20future%20ITs%20new%20imperative/Partnering-to-shape-the-future-ITs-new-imperative.ashx [Accessed 12 May 2018].

Nelson, R.R., Todd, P.A., and Wixom, B.H. (2005) Antecedents of Information and System Quality: An Empirical Examination Within the Context of Data Warehousing. *Journal of Management Information Systems*, Spring, Vol. 21, No. 4, pp. 199-23. <https://doi.org/10.1080/07421222.2005.11045823>

Netsuite (2019) Benefits of an Integrated Business Software System. Available at: <https://www.netsuite.co.uk/portal/uk/resource/articles/software-system.shtml> [Accessed on 12 October 2019].

Petter, S., DeLone, W. and McLean, E.R. (2013) Information

Systems Success: The Quest for the Independent Variables. *Journal of Management Information Systems*, 29:4, 7-62, DOI: 10.2753/MIS0742-1222290401

Petter, S. DeLone, W. and McLean, E (2008) Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, 17:3, 236-263, DOI: 10.1057/ejis.2008.15.

Popovic, A., Hackney, R., Coelho, P. S. and Jaklic, J. (2014) How information-sharing values influence the use of information systems: An investigation in the business intelligence systems context. *Journal of Strategic Information Systems*, 23, pp. 270–283.

Pratap, A. (2020) MANAGEMENT INFORMATION SYSTEM: ROLE, CHARACTERISTICS AND ADVANTAGES. Notesmatic. Available at: <https://notesmatic.com/management-information-system-role-characteristics-and-advantages/> [Accessed on 12 December 2020].

Quick, J.C. and Nelson, D.L. (2013) *Principles of Organizational Behavior*. 8th ed., South-Western.

Rouse, M. (2020) marketing information system (MkIS). Available at: <https://whatis.techtarget.com/definition/marketing-information-system-MkIS>

WhatIs.com [Accessed on 03 February 2020].

Sahoo, C.K. and Jena, S. (2012) Organizational performance management system: exploring the manufacturing sectors. *INDUSTRIAL AND COMMERCIAL TRAINING*, VOL. 44 NO. 5, pp. 296-302.

Sales, X. (2018) A proposed methodology for evaluating the quality of performance management systems. *Pacific Accounting Review*, Vol. 31 No. 3, 2019 pp. 376-393. DOI 10.1108/PAR-03-2018-0019. DOI 10.1108/00197851211245059.

Salesforce (2017) *Your Complete CRM Handbook*. Available at: <https://a.sfdcstatic.com/content/dam/www/ocms/assets/pdf/misc/YourCompleteCRMHandbook-8.pdf> [Accessed on 23 June 2018].

Sebjan, U., Bobek, S., Tominc, P. (2014) Organizational factors influencing effective use of CRM solutions. *Procedia Technology*, 16, pp. 459 – 470.

Sloan, N., Agarwal, D., Garr, S., and Pastakia, K. (2017) Performance management: Playing a winning hand. 2017 Global Human Capital Trends. Deloitte. Available at: <https://www2.deloitte.com/us/en/insights/focus/human-capital-trends/2017/redesigning-performance-management.html> [Accessed on 22 May 2019].

Smartsheet.com (2020) Management Information Systems: In Business, in Academia, and in The Future. Available at: <https://www.smartsheet.com/management-information-systems> [Accessed on 21 January 2020].

Sripirabaa, B. and Krishnaveni, R. (2009) Performance management systems in an Indian manufacturing sector - Partnering, monetary incentives and the alignment of organizational goals. *Management Research News*, Vol. 32 No. 10, pp. 942-952. DOI 10.1108/01409170910994150

Van Vulpen, E. (2020) What is an HRIS? An HR Practitioner's Guide. Available at: <https://www.analyticsinhr.com/blog/human-resources-information-system-hris/> [Accessed on 12 December 2019].

Visser, M., Van Biljon, J. & Herselman, M., 2013, 'Evaluation of management information systems: A study at a Further Education and Training college', *SA Journal of Information Management* 15(1), Art. #531, 8 pages. <http://dx.doi.org/10.4102/sajim.v15i1.531>

WEF (2019) *The Global Risks Report 2019*, 14th edition. World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf [Accessed on 08 December, 2019].

