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Validating Information Sensing in a South African University as an Impetus to Improved Information Management Practice and Performances

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ABSTRACT This paper argues that the quality of business process management in organisations depends, first, on their information orientation and their Information Management Practices (IMP). Although information technology plays an important role, it is not in itself enough to guarantee the quality of information management practices without the alignment of internal and external information sensing. The objective of the paper was to validate information sensing as a significant element in improving the IMP and performance of organisations. Information sensing is the first phase determinant, on which the capturing and processing, organising and maintaining of information hinge. Purposive sampling was used to gather empirical data through in-depth interviews with eight members of staff, and one hundred students were surveyed through questionnaires. The findings showed that emphasis was placed by the respondents on the information-processing tools themselves, without a comprehensive understanding of the significance of information sensing. To ensure improved and efficient information management which promotes quality, rather than quantity, and the elimination of duplication, the paper proposes the recognition of internal and external information sensing. The paper identified four dimensions of information sensing, namely, internal and external and vertical and horizontal information sensing. Information sensing is necessary for improving the governance of information lifecycle about business processes, service delivery and agility. It is envisaged that its adoption has the potential to reduce the duplication of information by various business units, to reduce costs, to increase returns on investments and to improve the experiences of customers.

INTRODUCTION

In recent years, as a result of the proliferation of information technology, there have been correspondingly increased levels of information overload (Prytherch 2016; Murayama et al. 2016). Information overload often results in an exchange of information whose quality is too low, which may, in turn, sometimes lead to communication overload (Edmunds and Morris 2000; Ellwart et al. 2015; Harris et al. 2015; Lee et al. 2016; Rodriguez et al. 2014). Members of staff are often unable to use information retrieval systems to provide necessary information and render services within a reasonable time frame, to deliver satisfactory service to users (Pekhimenko et al. 2015). Often clients and customers are required to wait for considerable periods of time, as a result of slow service delivery and information retrieval. These delays are usually either partially owing to a lack of clarity concerning the sources of the required information, or an inability to identify the custodians of accurate information or the member of staff who is likely to be able to supply the precise information required. Sometimes the retrieval of information, whose turnaround time is expected to be within a definite time frame, is unduly delayed. In these instances, it may be concluded that the information orientation, the IMP and the information formalities of the organisation have not been sufficiently well coordinated to facilitate process agility.

As a consequence, the valuable time of both institutions and customers is lost, resulting in inefficient retrieval of information, slow business processes and incomplete tasks, all of which, in turn, often lead to the experiences of customers being less than satisfactory. An active personal information sensor needs to possess contextual knowledge of the needs regarding information

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of an institution or a client, to retrieve information, direct queries, provide high-quality service and tailor-made improved customer services (Bennett et al. 2015). In an attempt to work more efficiently, organisations invest heavily in systems which enable smart and agile processes through an automated sensor. Just as remote sensors employed in lighting systems, cars, smart cities and smart houses are programmed to detect and sense information on the basis of the parameters according to which they have been designed. The same capability is required of any knowledge worker in an organisation, as they have an obligation to have the ability to sense vital information concerning economic and socio-political changes, market shifts, and changes in the requirements of customers. The workers must be able to sense information on innovations made by competitors and to detect information regarding anticipated problems with suppliers or between stakeholders.

In order to create intelligent offices and business environments, technologies for developing sensors and networks have been adopted (Baek et al. 2007), with a view to facilitate the gathering of accurate and useful information within a minimum prescribed time frame on clients, business processes, products and innovations. Businesses flourish when there is a reliable supply of appropriate information, as it enables them to conduct business transactions within limited time frames. The quality of information as a business asset in an organisation is interwoven with its availability, and these variables often distinguish successful organisations from others. Information management (IM) has five phases in its lifecycle, namely, sensing, collecting and capturing, organising, processing and maintaining. Information sensing enables the detection or sensing of sources of useful, relevant information, either to accomplish tasks or to rendering services to customers making enquiries. The quality of the sensed information determines that of the other systematic phases of information lifecycle. As the ability of every organisation to function efficiently is determined, inevitably, by the accessibility and the quality of information, it is necessary to establish frameworks which promote business intelligence through developing their capacity for sensing sources of appropriate information.

This need has resulted in the development of pervasive information technologies and networked environments which have significantly influenced corporate data management (Waldman 2016) in the contemporary epoch. However, information management practices hinge on the quality of information as a valued business asset, and the creation of information depends on the quality of the means of sensing information, as the information management lifecycle begins during the sensing phase. While it may be argued that the quality of the processing of information is equally crucial, often an organisation's orientation with respect to information dictates the processes or tools which are needed to facilitate the efficient completion of tasks to ensure satisfactory levels of performance. As the activities of organisations revolve around information, the quality of the service which they can provide is directly linked to the quality of the information which is used to deliver services to meet the needs of customers and ensure their satisfaction. The orientation of organisations on information denotes their practices concerning information, while structural information architecture denotes the sensing of information.

Literature review

Information Practices

The Information Orientation (IO) capabilities of organisations comprise their Information Management Practices (IMP), Information Technology Practices (ITP) and Information Behaviours and Values (IBV). The coordination of these capabilities is essential for achieving improved performance (Marchand et al. 2002). An organisation with high IO capabilities is expected to record high levels of business performance (Kettinger et al. 2011). Choo et al. (2006) reported that organisation IO capabilities promote information formalities and processes which encourage employees to use the sources of institutionalised information of organisations willingly (Marchand et al. 2000). However, IBV encompasses the physical and intellectual behaviour towards information sensing of organisations in the processing, sharing, maintaining, storing, searching, retrieving and use of information (Wilson 1997, 2000). The same view as shared by Carmichael et al. (2010), IMP concerns the sensing, collecting, organising, processing and maintaining of information. The levels of performance which an organisation can achieve

depend on its capabilities on information and regarding managing and using information resources to aid its overall performance. The robustness of the fulfilment of an organisation is linked by Mithas et al. (2011) with its Information Management Capability (IMC), which drives the improving of levels of performance, with respect to the capabilities required in the domains of customer service, business processes and performance management.

The IMP of an organisation is vital to the quality of the daily decision-making activities which are carried out to satisfy an often embryonic demand from customers. Consequently, to remain competitive, the quality of disseminated information cannot be allowed to fall below that of business competitors, which makes it of great importance for an organisation to engage in external information sensing to make explicit the IMP of any competing organisations. This objective may influence actions to redesign the overall capability of an organisation with a view to overcoming the advantages enjoyed by other organisations. The ability of agencies to study market trends and the needs of customers has the potential to position the institutions to realign their IMP to meet the changing demands of customers. In the global business environment, all activities of organisations need to adopt practices of this sort to gather business intelligence. The IMP model demonstrates how the information technology of an organisation and the interactions of the people participating in the firm processes combine to generate the information systems which are needed to improve the levels of performance of the organisation (Marchand et al. 2000, 2002).

Information Sensing

Information sensing entails the ability to recognise and identify useful information which is usable and has an intrinsic value for the user and the stakeholders (Ke 2011; Choo 1998). The sensing of information eliminates the possibility of disorientation which is often caused by a lack of useful information (Bustnay et al. 2008). To illustrate the importance of information sensing in a practical situation, an information sensing system was invented for a fire fighting operation which proved resourceful for the sensing and sharing of crucial information during firefighting operations and efficiently facilitated the completion of tasks and improved service delivery. The same principle applies in practice to IMP in organisations to promote business agility. An organisation which is equipped with appropriate information orientation and systems may escape the problems caused by unforeseen circumstances which are capable of disrupting an operation or lowering levels of efficiency. Marchand et al. (2001) explain that socio-economic and political climates affect both businesses and the needs of customers. However, how organisations detect the relevant information about shifts in markets or operations is crucial for their competitive advantage and sustainability.

This paper investigated an institution which operates within a knowledge economy, in which the majority of its qualified employees are regarded as knowledge workers. Hypothetically, these workers should be able to manage the needs of students with respect to information, consistently, in a changing academic milieu, in reaction to global trends. The significance of this paper lies in the crucial need to know how the needs and requirements of students with respect to information, which reside mainly in the domains of technology and innovation, are met. Invariably, the information sensing capability of the staff of the institution plays a linking role in the accomplishing of this task, as in any institution of higher learning students are regarded as the most significant stakeholders. Their requirements on information services can be met by ensuring optimal service delivery, through high-quality administrative processes. The extent to which the information services can meet the demands and expectations of students adequately may depend, to a correspondingly large extent, on how the staff is managing the information needed by students. This, in turn, is determined by the ability also to sense the needs of students with respect to information. Consequently, the accuracy of the information about the admission and registration of students is vital to making an accurate measurement and assessment of the capability of the institution with respect to supplying the information required by the students. This sensing capability is an important consideration for investigating how useful information is detected and sensed within the system, as it has a direct link to the quality of information which is disseminated. The level of, and the quality of information provided, in turn, may influence the prospects for im-

proved levels of performance on the part of the institution.

It is also of primary importance that organisations can increase their information sensing capabilities and potentials by paying close attention to the needs of customers and by continually sensing and assessing the IMP capabilities of competitors. Increased capacity of information sensing is useful for forecasting and projecting complex scenario simulations to avert anticipated problems in service delivery. It is crucial to reiterate that information sensing by organisations is inextricably bound up with the searching for and the obtaining, collecting and the creation of information. According to Ward and Peppard (2002), organisations are continually sensing and are in search of information concerning access to markets, the needs of customers, competition, trends, innovations and other external factors which either directly or indirectly link with enhancing or improving competitive advantages. Fallis and Whitcomb (2009) explain that "the reason for seeking information is to acquire knowledge, or to find truth and justification." Seeking information constitutes an individual quest to maximise learning and the acquisition of available relevant knowledge (Fallis and Whitcomb 2009). Although it is possible to request information not merely to acquire knowledge, also for other purposes, such as entertainment, it can also be sought with a view to consolidate self-belief, to avoid making errors or to look for the truth. Similarly, information sensing within an organisation is undertaken in order to accomplish specific goals, which, in turn, often initiates the process of sensing an environment for the acquisition of relevant information.

Research Question: What role does information sensing play in improving levels of performance at the University of Fort Hare?

Proposition: The ability to sense information will enable agile IMP and result in improved performance at both the individual and institutional levels.

Theoretical Framework

An information lifecycle interprets the systematic and logical processes of information management, irrespective of format or whether it is manually or electronically managed. The theory underpins the systemic processes of sensing, collecting, organising, processing and maintaining information. Although, the framework has been used differently by researchers in various disciplines (Bhander et al. 2003; Deng et al. 2015; Hernon 1994; Hodge 2000; Levitan 1982; Moki et al. 1995; Runardotter et al. 2006; Su et al. 2006; Tallon and Scannell 2007; Taylor 1982). Its core principle remains the same. The theory was adopted for this paper with specific emphasis on the premise that information has no irrefutable beginning and that it is continuous. According to Marchand and Kettinger (2011), it is debatable whether it can be asked: "where an information lifecycle begins." As an information lifecycle is 'business-centric' it's systematic sensing, creation, use, maintenance and disposal are crucial for corporate governance and improved levels of business performance.

The theoretical framework was used to classify the information sensing dimensions into internal and external information sensing. The external dimension can include information sensing at the strategic level, often within the top management echelon. It is often concerned with sensing economic, social and political changes, information about corporate governance and the innovations made by competitors. Internal information sensing focuses on operational staff sensing information concerning shifts in markets and demand from customers due to the operational staff proximity to the customers. Internal information sensing plays a significant role in supporting the IMC of an organisation with respect to customers. These capabilities enable the effective and efficient creation, classification, automation of information and the implementation of integrated information services and policies (Reiner et al. 2004). Their application can improve systems which render information useful during its lifespan (Bernard 2007), through integrations of policies, processes, practices, and the alignment of tools in order to realise the business value of information in a cost-effective manner (Turczyk et al. 2007).

METHODOLOGY

The architecture of the research methodology comprises a formulation of research methods and a presentation of the findings, followed by a discussion of their validity. A qualitative approach was adopted to conduct the study, using a research design which was progressively

readjusted to fit the purpose of the survey (Babbie 2010; Creswell and Clark 2007; Leedy and Ormrod 2011; Maxwell 2012). Triangulation was achieved by means of augmenting the data which was obtained from the interviews and questionnaires with observations. A stratified purposive sampling technique was used (Neuman 2006), which was based on the variables concerning the sensing, collecting and processing of information which were developed by the researcher against the background of his practical knowledge of the research setting and the results of the pre-test pilot study which had been conducted. The paper sample comprised eight members of staff and one hundred students. The approach adopted by the researcher to the conducting of the study was informed by the work of Marshall (1996), Ritchie et al. (2003) and Teddlie and Yu (2007). The justification for including the students in the research sample was premised on the fact that they are the recipients of most of the information which is sensed and collected at the University of Fort Hare. As they are the clients of the institution, their levels of satisfaction and perceptions of the degree of service delivery can be used to measure both the IMP and level of performance achieved by the institution. A voice recorder was used to capture the staff interviews, which were transcribed and imported into Nvivo software for analysis. Decision tree software was used to identify the themes which will be presented in the findings.

A qualitative approach was adopted to study the phenomenon under investigation in a practical, real-life setting, as earlier studies (Marchand et al. 2000; Marchand et al. 2002; Marchand and Peppard 2008; Kettinger and Marchand 2011) have adopted a quantitative approach to study the dimensions of IMP. However, these previous studies have relied on self-reported data from the top management staff within organisations (Marchand and Kettinger 2011; Marchand et al. 2002). The limitation of their studies lies in the fact that the administrative personnel implementing business processes Information Management (IM) were not included in them. This finding informed an alternative approach to investigate IMP, with a particular focus on information sensing and its implications for improved levels of performance in organisations. It appears that no studies have been conducted concerning the link between IMP and improved levels of performance in the context of South Africa and that no studies have been conducted in higher education institutions to investigate the relationship between information orientation and improved levels of performance.Consequently, there is a need to apply the model to the business sub-processes of a university in South Africa. According to Ke (2011), there is a need to use Marchand's theory and model to more companies, and Kettinger and Marchand (2011) have reiterated the need to study the model in depth.

RESULTS

The data in Table 1 shows the distribution of the staff members in the research sample with respect to their designations and their years of service and experience within the university system (Table 1). The students were purposively sampled, and the postgraduate students in the sample comprised twelve PhD students and fifteen students who were pursuing Master's degrees. The undergraduate students included nineteen from year one, twelve each from years two and three and twenty-one from year four.

Table 1: Demographic data of the respondents

Respondent	*Position*	*Year of experience*
Respondent 1	Manager	18 years
Respondent 2	Administrator: operation	2 years
Respondent 3	Faculty Officer	7 years
Respondent 4	Administrator	2 years
Respondent 5	Senior Administrator	15 years
Respondent 6	Administration/operation	14 years
Respondent 7	Officer: administration and operation	11 years
Respondent 8	Operation	7 years

While investigating the IMP framework of the institution during the collecting of the data, it was found that the capturing, organising, processing and maintaining of information all depend on the sources of information. Consequently, the human agent working within an institution represents an embodied information sensor. The capability of the agent to locate information sources and concisely identify relevant data within organisations or pertaining to clients is vital for the successful applications of the IMP of the institution. Accordingly, the qual-

ity of the information which is available for decision making is dependent upon the information sensing capabilities and the overall skill of the staff within the IMP lifecycle. However, the ability of the business units and personnel to make sense of the five phases of the firm IMP lifecycle has the potential to generate improved performance through increased and sophisticated capabilities. But, these abilities will include the institution prowess to be able to make sense of the five IMP constructs in order to improve their IMC and performance, as is shown in Figure 1.

This model underpins the lifecycle of IM, and, for this paper, it was imperative for the respondents to determine the quality of their IMP sequentially in the execution of each task. The study attempted to apply the sensing construct of IMP in the context of an institution of higher learning in South Africa, to confirm the interrelated nature of the relationship between the quality of information services and improved levels of performance in a practical, real-life setting. The theoretical framework which underpins IMP maintains that the information lifecycle begins with the sensing of information. From this initial proposition, it is proposed that the quality of IMP is dependent upon the quality of the information which is sensed. However, organisations need to be aware that merely possessing information and being able to make good use of it are not sufficient to ensure that proper use will be made of the rich information resources which are needed for the efficient gathering of business intelligence.

Information Sensing

In order to determine the extent to which formality with respect to information plays a significant role in improving the performance of the institution, the respondents were asked whether they believed that the ability to detect useful information could result in improved levels of performance. Below are excerpts from responses of the eight respondents who were interviewed. Each respondent is identified using a numerical suffix appended to the letter R.

Yes, it will improve performance, because, if you are able to get the information needed, it will assist in your decision-making R1. *If the right information is received, it gives you the knowledge to use the same information, and when this is accurate, it helps your performance.* R2. Yes, if you have got a software program that can assist you in sensing the required information, obviously it makes your task quicker R3.

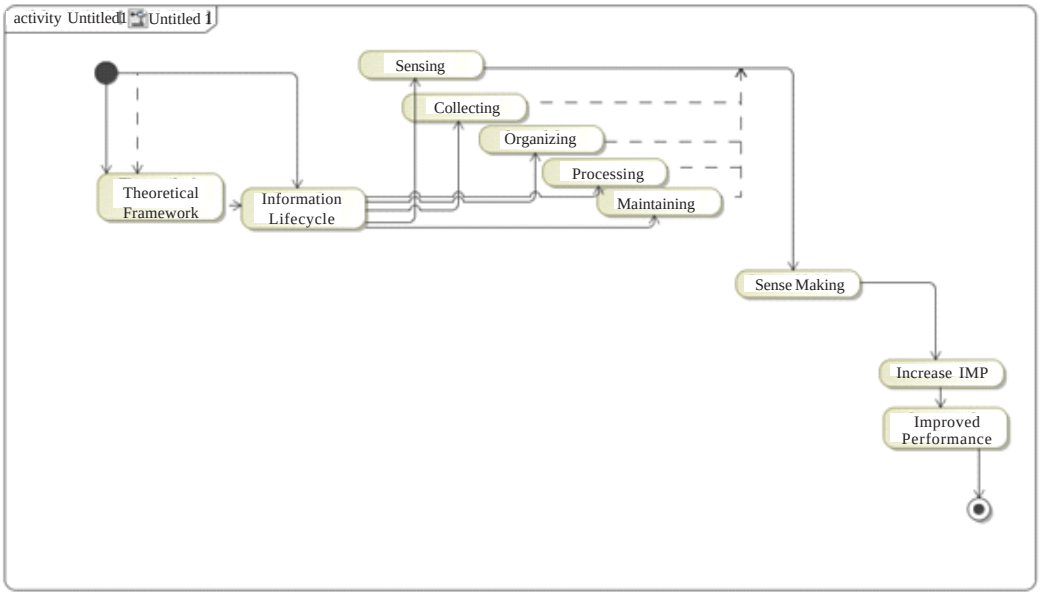

Fig. 1. IMP framework links to improved performance
Source: Ajibade 2014

Unfortunately, what some of the other institutions have that we do not currently have, is a system that manages information centrally, in which information is in 'sync' with linking databases to assist in the quick retrieval of information in most processes R2--.

That is true because the quality of the information and the ability to detect useful information are related to the output R4. *Yes, an information sensing ability may improve your performance, although some of the information is supplied by the people that we are dealing with, other information, you have to source it somewhere else* R5. *Information retrieval plays an important role. Files need to be organised just as records, and good record keeping is essential* R6. *Yes. The retrieval of information plays a significant role. The time to access information reflects the organisation's overall performance, and this will contribute to excellent customer service and improves professionalism* R7. R8 *Yes, it will improve performance, and suppose I have the power to effect any changes, that would be one of the things I would do to benchmark with another institution process, and this would improve the system.*

The responses of the respondents corroborated the fact that the ability to identify valuable information would provide the information required, assist with decision making and improve their levels of performance. This finding was consistent with the theory and the results of Marchand et al. (2000, 2002) and Marchand and Kettinger (2011). On the other hand, one respondent indicated that software-assisted practices might improve information sensing and make service delivery quicker. Another respondent said, "What their current IMP lacks is a system that manages information centrally, where all information is synchronised to a database which is linked to departments."

These responses indicate that once it has been recognised that synchronisation and linked databases could increase productivity and improve performance, if the strategy is not implemented, a culture of negative behaviour with respect to information could develop as a result of low morale among workers, which could, in turn, cause a further deterioration in the IMC of the institution. Diminished IMC would inevitably entail an underdeveloped IMP capability and low levels of maturity in the skills of the workers, which would have an equally adverse effect on the prospects of the institution for improving levels of performance. When databases are not centralised and do not have appropriate linkages, different versions of the same information are likely to be created by the various individual provenances and sources of information, which would entail a lot of unnecessary duplications, particularly in institutions without "institutionalised information formalities." The inability to synchronise databases is likely to slow down the updating of applications and turnaround times, as most of the tasks are carried out manually. The detection and retrieval of useful information held by the institution which is stored in the knowledge libraries for the use of individual business units or departments are likely to be hindered or impeded. As a consequence, servers can become overloaded, as a result of volumes of traffic caused by sensing or searching for information needlessly, wasting valuable resources and rendering useful information inaccessible.

The respondents confirmed that information sensing has the potential to improve the completion of individual tasks and to improve levels of performance at the institution. From an assessment of the tasks performed by some of the respondents, the researcher concluded that performance could be significantly improved if information sensing were to be subdivided into internal and external sensing dimensions and vertical and horizontal information sensing orientations. This stratification of sensing would enable a clear understanding to be gained of the business sub-processes of the admission and registration of students without overlapping, thereby promoting improved agility. This assessment may provide a concise appraisal of the complexities with respect to information which is inherent in institutions such as the University of Fort Hare and its formalised and institutionalised internal practices pertaining to information. It was learned that the Executive Management Council (EMC), the governing body of the institution, deals with strategic and corporate information and information pertaining to management. This implies that external information sensing concerning economic valuation in the sphere of strategic and corporate governance, social and political changes and shifts in markets are the preserve of the EMC. This include instituionalised information managgement that pertains to both the external information sensing dimen-

sion and the horizontal information sensing between institutions.

Internal information sensing concerning the requirements of students is the responsibility of management, although the administrative staff of the institution are better positioned to perform this role, owing to their proximity to the students. This might be an unidentified factor in an earlier study conducted by Marchand and Kettinger (2011), in which very low factor loading and CFA concerning information sensing constructs were found. However, this limitation was acknowledged by the researchers in their presentation of their results. In the field during the conducting of the pilot study, when this construct was used generically to elicit responses from the interviewees, it was evident that the respondents found it difficult to respond initially to generic constructs without adapting them to the context of their own operational tasks. However, after they were used in the context of their business processes, they were able to understand them. Consequently, using these constructs in their generic form may not generate the rich information required by qualitative studies. Nevertheless, it is instructive to break the information sensing construct down to the level of individual items and to adapt it to the specific contexts of the different business processes of institutions and organisations in practical real life settings.

It was found that the respondents were not aware of and had difficulty in understanding the information sensing construct during the pilot study and the period of collecting data for the research study itself. Although most of them were familiar with the collecting, organising, processing and storing of information, after several laborious attempts the concept of information sensing was explained, and the construct had been aligned to the contexts of their various daily operations, they were able to understand the variables pertaining to information sensing. The problems experienced by the respondents in understanding information sensing were consistent with those which emerged in the findings of the study conducted by Marchand and Kettinger (2011). The researcher made considerable efforts to explain the concept of information sensing, in order to bridge the gap between the theory and the actual practices of this institution. This finding indicated clearly that a quantitative survey might not have revealed the prevalence of these problems in an academic milieu, which has grave implications for the potential success of the IMP of the institution. The inability of the respondents to understand information sensing may suggest ineffective IMP in the information lifecycle of the establishment. As sources of essential information for business intelligence may be unavailable or inaccessible for the facilitating of decision making, the IO of the institution may not be fully operational or sufficiently well implemented to support the attaining of improved levels of performance. This state of affairs can permit loose information formalities, which are not ideal for the success of institutions and improved levels of performance. Consequently, it may be interpreted that the construct is either not in use or that it has yet to be tested and adapted to the operational duties of the respondents.

The staff will need to acquire grounded information competencies which promote improved IMP and service delivery, which will require employers to acquaint their employees with in-depth IMP as a means of improving levels of performance, in order to establish information resources as business intelligence which is of great importance and significance.

If senior management executives had been surveyed, as they were in earlier studies, it is entirely conceivable that this study may not have been able to uncover the problems which it has identified. As the EMC is not responsible for implementing the strategies of the institution, which has fallen to the operational staff, hence, it is appropriate that members of the operational staff should have been included in the investigation of how the institution uses information sensing constructs. It was found that the responses which were given by the respondents were not compatible with using the construct created by Marchand's model to sense information in the institution at the operational level, which indicated significant obstacles for the practical application of the construct. As a result, the construct was adapted to the context of using information in an academic environment. As previously pointed out, at the level of individual items, with respect to how institutions sense information concerning economic, social and political changes, the construct may not be suitable for use by administrative and operational personnel. This conclusion is based on the fact that the boards of directors, the CEOs, MDs and

executive management councils (EMCs) of institutions are primarily responsible for governing and sensing this type of information.

The study found that information sensing was carried out mainly internally, from within faculties, departments and business divisions throughout the institution. Although one respondent explained that when it is felt to be necessary, they usually conduct 'micro-level' information sensing with other institutions, for the purpose of making comparisons of statistical data, for subject-specific purposes. This finding may confirm the assessment of the researcher of external sensing at the top management level. It may be suggested that information sensing at the operational and administrative levels focuses on internal-vertical-horizontal movements, but the response of the participant also indicated that external sensing might take place at the operational level. It was concluded that as the university comprises three separate campuses, intra-campus and inter-campus information sensing is an essential component for ensuring improved levels of performance for the institution as a whole. However, without a coherent and appropriate IO and information formalities which ensure that the information about the business processes of all units is explicitly implemented, the IMP of the institution may be prone to suffering from setbacks. It was suggested that for some sensitive decision making, "benchmarking with other institutions might be required, and this process might lead to increased efficiency and improved performances." However, two of the respondents explained that benchmarking was seldom carried out, despite its importance for the external information sensing capabilities of institutions.

The data concerning students as clients yielded very insightful information on information sensing. It is maintained that when an institution is equipped with adequate IMP capabilities, it may be able to sense external information for competitive advantage, resulting in it being better positioned to offer superior services to those provided by its competitors. However, if clients perceive that a rival company is better equipped to provide better or superior services, the company might lose its competitive edge, as a result of its inability to sense externally the information needed to maintain its competitive advantage. In this study, surveying students in the role of customers provided one of the criteria used by the study for measuring improved levels of performance. The capabilities of organisations to sense the innovations of competitors, shifts in markets and the requirements of customers are vital for sustaining the ability to continue to raise levels of performance. The responses from one hundred students concerning the external information sensing constructs employed by the staff of the institution are presented in Table 2. The ability to benchmark is derived from sensing the improved practices of competitors, and internal information sensing is carried out to bridge operational loopholes. When customers perceive that they have received excellent service, they are unlikely to suggest that benchmarking is needed to improve performance. However, the flat indicator proves the necessity for the staff to benchmark their services in order to enhance their performance. It was also found that the existing information services are not satisfactory, which was reflected in the recognition of the need for comparison and benchmarking. It was discovered that 17 percent of the students agree, and 48 percent strongly agree that external information sensing should be implemented by the institution, to benchmark with other institutions. It is envisaged that this process will improve the quality of services, improve performance and meet the requirements of clients with respect to services. The finding showed that the customers understand their needs, and this information is useful for enabling the institution to specify requirements to improve levels of performance and customer satisfaction. The students were also asked whether they were satisfied with the present IMP of the institution regarding service delivery with respect to information concerning the processes about applying for admission. Most of the

Table 2: Benchmarking the need to compare information pertaining to registration and admission with other universities

S. No.	*Variables*	*Percentage*
1 =	Strongly disagree	6 %
2 =	Disagree	7 %
3 =	Partially disagree	6 %
4 =	Not Sure	8 %
5 =	Partially agree	5 %
6 =	Agree	17 %
7 =	Strongly agree	48 %
	Missing data	3 %
Total		100 %

respondents (84%) complained about slow delivery and the quality of the information which they received.

DISCUSSION

The study conducted by Marchand and Kettinger (2011) had acknowledged the need to carry out more in-depth research, in order to investigate the IMP model comprehensively. The findings of this study show that information sensing is not performed in a manner which fulfils the potential of the construct at the institution at which the research was conducted. In their finding of 2011, Marchand and Kettinger reiterated that as the information sensing construct is relatively new, it is a less recognised construct than many others. However, this study has refined the construct, particularly at the item level.

First, the study identified that one of the reasons for the result pertaining to the sensing construct being low could probably be attributed to an inability to recognize the dynamic nature of various organisations. Consequently, it becomes necessary to design more generic questions for the construct, which could be used by different members of staff, regardless of their positions, and taking into account their routine daily office tasks. The different characteristics of the hierarchical levels of governance which exist within the individual administrations of institutions and organisations also need to be taken into account, and it is equally necessary to ensure that the internal and external information sensing is clear within the IM formality of the institution. Secondly, the paper was able to identified and classified information sensing into two dimensions with four directional orientations, regarding internal and external information sensing orientations. The horizontal orientation requires top management to detect information concerning shifts in markets and the political and social, economic climates, while the middle management and operational personnel are primarily responsible for detecting information concerning the needs and requirements of clients and their levels of satisfaction, owing to their proximity to most of the clients.

Thirdly, the study identified an obstacle in the form of the difficulty experienced by the respondents in making sense of information sensing. Consequently, it was suggested that the institution needed to recognise the vital role played by internal information sensing. This paper explained that internal sensing can occurs in a vertical orientation from the top to lower management and from the lower level to the top management. This requires the middle management staff to have the ability to detect information internally within the operating procedures of the institution and to sense the information needed to accomplish all of their tasks. Fourthly, it was found that internal sensing has a horizontal dimension between colleagues, departments and from one business unit to the others. Consequently, a complement of sensing constructs which does not give due consideration to this dimension may be unable to make adequate use of the construct in order to achieve improved levels of performance. A failure to recognise the role played by the construct could result in an avoidance of identifying those constructs which are best implemented by the operational and administrative personnel or the CEO or company director.

Finally, the study has been able to provide an alternative approach to the IMP of the institution in the form of a bottom-up approach. This approach investigated the use of the construct by drawing samples from the operational and middle management levels, rather than the samples drawn from the top management levels employed in earlier studies. The rationale for this decision lay in the fact that most of the constructs for information sensing, except some external sensing constructs, are directly implemented by the operational staff and middle management, and not necessarily the top hierarchy. By adopting this approach, the study endeavoured to augment the methodological approaches of previous studies.

The study demonstrated the appropriateness of using a bottom-up approach, rather than the top-down one adopted by Marchand et al. (2000, 2001, 2002) and Marchand and Kettinger (2011). This strategy was aligned to the assessment of Lee-Kelly (2003), who maintains that while the dashboard created to measure performance had provided useful insights, a bottom-up application would have provided rich insights. The paper concludes that with the exception of information sensing which is directly linked with the top levels of management represented by the CEO, CIO and MD for gathering data concerning the political and economic environments. The remaining four constructs,

namely, the sensing of information pertaining to economic, political and social changes, the sensing of information relating to the innovations introduced by competitors, the sensing of information relating to shifts in markets and demand from customers and the sensing of information in anticipation of disruptive phenomena are sensed by the middle management. This is because the operational management level sense information in order to be adequately prepared to make informed decisions, should be employed using a bottom-up approach, with a view to obtain useful insights and rich data.

The implication for institutions, businesses and organisations, however, is that, without a thorough understanding of information practices, in particular with regard to internal and external information sensing, they may not be able to make adequate use of informatics to their advantage. As business processes use information for decision making, the amount of high-quality information which they have at their disposal is crucial for the effectiveness and the efficacy of their decisions. However, the quality of information is indirectly dependent on the granularity of the design of the information service of an institution or an organisation and how comprehensively it can meet its requirements.

A comprehensive understanding of the explicit nature of information sensing required by an institution or an organisation would aid the modelling and designing of its information system to enable the various operations which it needs to be carried out. These capabilities can be incorporated into the design and the automation of business processes in order to facilitate increased levels of performance. Because there are functional requirements to be considered and technical capabilities of a design are dependent upon how clearly the information sensing of an organisation is understood by the designers of the system. The system designer will work with knowledgeable personnel to document business requirements, from which the service requirements will be derived. This information should inform the systems analyst of the specifications regarding requirements which would be crucial for the optimal service delivery, and detect shortcomings during the operation of the system for the necessary adjustments to be made. However, if the internal and external information sensing constructs of an organisation are not task-specific, it may be difficult for the organisation to function optimally with the resources which are available to it without the ability to improve its information sensing capabilities.

This assessment is borne out by the model of Goldstein et al. (2002), which explains that between the strategic intent of an organisation and its customers, there is a service concept, whose ‘what and how’ have been explained above. The services inputs require people, technology, processes and equipment and a service delivery system to measure performance. Consequently, organisations should not place emphasis on technology without giving adequate consideration to the input required from the personnel and the capabilities which they need to possess, and business sensing processes to increase agility. Before information software is developed, there is a need to know the function which it is intended to perform and the processes which should be included in the system’s range of capabilities and applications. As has already been noted, the first phase of the information lifecycle is information sensing.

The quality, depth and richness of the information which can be sensed constitute the building blocks for all other information management phases, such as the collecting and capturing, organising, processing and maintaining of information. The information which is sensed is collected, organised and maintained for optimal levels of operation and decision making. Using a precious stone as an analogy, although the quality of the stone which is excavated from the ground is directly linked to the number of carats which it possesses, the stone needs to be processed and refined in order to make it attractive to prospective human purchasers, the same holds true for the information which is obtained through information sensing. Although, in traditional terms, costs, revenue streams and profits and returns on investment are all performance metrics, service and functioning require a system which is dependent upon the granularity of each function to meet specific business needs. If the information sensing dimension is not conceptualised and efficiently introduced into an organisation, return on investment (ROI) may be compromised, like duplication, inefficient use of data and a low quality of information may be consequences.

Poor performance, owing to the incompatibility of a system to meet the core functions of business, can result in a misalignment of IT on

business operations. The correct alignment of IT entails the need to understand which business units are responsible for gathering information A, and the role of department B in reusing the same information, department C reusing information collected by A and B, and establishing whether department D trusts the sources A, B and C respectively. Organisations need to identify the management levels which are responsible for internal-external information sensing and which business units or personnel are in charge of internal vertical information sensing and flows. It is necessary to determine whether there is a hierarchical structure in the vertical movement of information and whether the governance of information is sufficiently flexible to accommodate changes or rigid, in order to decide whether agile or generic processes could be adapted.

CONCLUSION

Based on observation, it is maintained that without institutionalised information formality and the capability to harness rich and appropriate data, the capturing, organising, processing and maintaining of business information may be compromised. The development of mature information capabilities and the ability to profile those needs of clients which are crucial for ensuring their satisfaction, which constitute the essential functions of the sensing construct are likely to be hindered. This may create problems in ensuring the timely delivery of services and the efficient management of business information, which is a catalyst for improved levels of performance. The study identified serious shortcomings in the use and application of information sensing dimensions at the institution in which it was conducted. It is suggested that more insights need to be gained by making the construct operational or improving it at the level of items, in the domains of internal and external and vertical and horizontal information sensing. An intensive study of information sensing at the institution could yield a greater understanding of IMP, which would almost certainly contribute towards steadily rising levels of performance.

RECOMMENDATIONS

The range of possible applications for information sensing needs to be explored, as it is almost limitless. The item constructs may be employed in any organisation, irrespective of its size, the nature of the industry in which it participates or the composition of the organisation. The widespread use of information sensing techniques has the potential to make their significance and applicability more understandable to people filling positions similar to those of the respondents in this paper. There would be a general understanding among the personnel of the institution that the information life cycle begins with the sensing of information and not at the collecting or capturing stage. It should be stressed that the information collecting, organising, processing and maintaining construct may be put to its best use by operational and administrative personnel. This assessment was made possible by the in-depth nature of this study and the methods which were used to collect the data, and it may not have emerged from a study which employed self-reporting and quantitative analysis.

It is recommended that four-dimensional sensing should be investigated further by the institution, taking into consideration the internal-external horizontal and internal vertical-horizontal dimensions. It is also suggested that exploring the possible applications of sensing could serve to foster collaborative thinking toward developing the expertise needed to identify ways to capture information to ensure a competitive advantage, to minimise potential threats and to maximise levels of performance. Longitudinal studies employing triangulation of methods or, possibly, even triangulation of theories in domains such as business process management, could generate a greater understanding of the implications which information sensing has for the performance of organisations in relation to internal information sensing as an enabler of improved decision making and levels of performance.

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