Performance measurement system in Malaysian public research universities: is it contemporary?

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Abstract: Performance Measurement System (PMS) is an important and effective mechanism to ensure managers' performance is in line with the objectives of an organisation. Positive effects of PMS on organisation performance are supported by empirical research but the study on contemporary elements of PMS especially in an education setting is still lacking. Previous studies on PMS dimensions tend to focus on a single construct. This study aims to examine the existence of strategic, comprehensive and dynamic dimensions in university PMS. Cross-sectional data were obtained from academic staff representing five research universities in Malaysia (N = 368). Exploratory and confirmatory factor analysis using Structural Equation Modelling (SEM) demonstrates that strategic, comprehensive and dynamic elements exist in university PMS. The findings from this study contribute to the line of research in the area of PMS design. Practically, the findings can be used as a guideline by universities in designing the PMS.

Keywords: performance measurement system; university performance; institutions of higher learning; management in university.

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1 Introduction

Owing to the globalisation of higher education, world university rankings have grown in influence in recent years. The classification used includes world ranking of universities, world university rankings, global university rankings using bibliometrics and global university ranking using web metrics. The dimensions used by these rankings show that the performance of academics contributes 60–90% of the overall performance of the universities. Since performance of academics is the key contributor of academic excellence, universities need to empower its human capital to be competitive and subsequently achieve world-class status. Performance Measurement System (PMS) is workable as a means to implement strategy, align behaviours and support decision-making to arrive at this objective. The universities' top management has recently begun to review the design and execution of their PMS.

Competitive pressure and advances in technologies challenge PMS in terms of its design, operational and strategic use. Organisations regardless of their size have to react to the changes and transform their resources to be more competitive. In the transformation process, PMS exists as an important factor as well as employee buy-in, teamwork and collaboration (MacBryde et al., 2014). It has a significant effect to the individual employee performance. It can be used for internal and external control purposes, while its development and usage can lead to strategic learning purposes (Fried, 2010). The effect of performance measure use on functional strategic decision depends on decision-facilitating and accountability (Artz et al., 2012). In addition, PMS claims to have the control package and internal consistency (Grabner and Moers, 2013). It is designed to achieve the greatest possible goal congruence such as an employee pursuing personal goals which are parallel to the organisational goals. Justice and fairness are crucial to be put in context in the design of PMS (Cugueró-Escofet and Rosanas, 2013).

PMSs are currently evolving and organisations are more likely to have a formal PMS which relies primarily on non-financial knowledge metrics (Rowe and Widener, 2011). It has been recognised as a critical factor for the effective and efficient management tool in a competitive environment. The need of contemporary PMS which consists of strategic,

comprehensive and dynamic measures is new in the literature. In a dynamic environment, the interaction between elements in PMS should be explainable and desirable. Timing has significant impact on the information in PMS as it guides the management to focus on dynamic changes over the organisational activities especially when non-financial measures are involved (Chen et al., 2014). Consensus between operational managers and employees is also critical for the success of the organisation's strategy implementation and the effectiveness of PMS (Ho et al., 2014).

PMS has added positive value to the organisation's competitiveness. Further investigation has identified diagnostic and interactive use of PMS which must be applied simultaneously. Diagnostic use involves the review of critical success factors in order to maintain and monitor the organisational activity, while interactive use refers to active and frequent involvement of top management in the monitoring process. The combination of high-level diagnostic and interactive use in PMS increases the organisational leading advantage and performance (Koufteros, 2014). However, high level of diagnostic use coupled with low level of interactive use produces low level of organisational capabilities.

PMS is a mechanism used by the management to supervise and control the direction of the organisation. As such, the efficiency and effectiveness of PMS is very important for an organisation which uses PMS as a basis of operations and improvement. PMS plays an important role in developing corporate strategy and performance evaluation for the organisation to be more competitive in the global economy (Ukko et al., 2007). It identifies individual effectiveness at all hierarchical levels within an organisation (Ubeda and Santos, 2007). Performance measurement also prepares useful information in the decision-making process (Ukko et al., 2007) and assists managers in planning and controlling (Chenhall and Langfield-Smith, 2007). In order to achieve good results, PMS should be comprehensive, strategic and dynamic but previous studies on PMS have focused on a single dimension. This study fills the gap by examining PMS through three constructs: comprehensive (Hall, 2008; Chenhall, 2005), strategic (Burney and Widener, 2007; Gimbert et al., 2010), and dynamic (Henri, 2010).

Comprehensive PMS relates to its multiple measurements, and focuses on strategic planning, integrative and incentive (Buhovac and Groff, 2012). Hall (2011a) defines comprehensive PMS as the ability of the system to supply enhanced performance information which links performance and individual role through providing a broad set of measures related to the importance of the organisation, the integration of measures with strategy and valued organisational outcomes, and the integration of measures across functional boundaries and the value chain. Strategic PMS refers to a system that explicitly relates organisation strategy and PMS (Choi et al., 2012). This process requires PMS users to have a high understanding of organisation strategy. Kennerley and Neely (2002) raised the need for PMS to be dynamic. Organisations should add, replace and drop certain PMS measures to incorporate changes in organisation.

Even though research with respect to the allocation of resources and the accounting system at the university level is growing, a study of performance measurement and management at department level and staff at the university is still lacking (ter Bogt and Scapens, 2009a). In addition, there is the difficulty of measuring university performance because it is based on service activity and hard to trace processes involved (Zangoueinezhad and Moshabaki, 2011). Focusing on the PMS design, this study aims to examine the existing of strategic, comprehensive and dynamic elements in the university PMS. The following sections of this paper present a discussion on the university PMS

and the idea of contemporary PMS. Next, definitions of strategic, comprehensive and dynamic in PMS are discussed by reviewing relevant scholarly journals. Then, the methods applied in carrying this study are elaborated and the analysis and findings are discussed.

2 Literature review

2.1 Performance measurement system in university

The need for reform in university PMS is associated with stakeholder demands and the desire to achieve high rankings in worldwide university classification. When there is greater competition, a competitive relationship between the stages of PMS development and performance is of higher significance (Lee and Yang, 2011). It has been proven that PMS is applicable and critically needed in public sector management especially in higher education. The comparison between the universities in the UK and the Netherlands highlights the rise of new performance measurement not only for government control, but also for management and control exercised within universities and within faculties (ter Bogt and Scapens, 2009b).

Universities in emerging economy economies have adopted PMS to improve organisational effectiveness and researchers are encouraged to explore the potential of management accounting tools in universities and public sector organisations (Hoque, 2014). In Austrian public universities, as part of PMS, a mandatory non-financial reporting process labelled Knowledge Balance Sheets (KBS) is used by stakeholders as a reporting tool for governance and accountability (Habersam et al., 2013). Recent work on PMS in the higher education makes use of the balanced scorecard to translate characteristics of strategic goals into performance measures (Francheschini and Turina, 2013).

Selected universities in South Africa develop the PMS model in enhancing the effectiveness of their lecturers' work by incorporating seven performance dimensions, namely knowledge, student–teacher relations, organisational skills, communications skills, subject relevance, assessment procedure and utility of assignments (Molefe, 2010). In Italy, the first integrated assessment of teaching and research quality was developed in University of Siena and it had positive impact on behavioural and organisational performance (Barnabè and Riccaboni, 2007). In Thailand, the proposed Thai Higher Education Classification Model (THEC) identified classification criteria for National Research Universities (NRU) which consist of research funding, the variety of instructional programs, the level of instructional programs, instructors and research staff body and student body which have significantly statistically influenced research output, citation and research award (Phusavat et al., 2011).

The demand for higher education in Malaysia is expected to grow as population increases and in tandem with the government's emphasis on human capital development. Ranking classification among universities has significant influence towards the management process in universities in this country. The World Bank Report titled 'Malaysian Economic Monitor: Smart Cities 2011' highlighted that Malaysia spends slightly more than most countries on its tertiary educations. Unfortunately, leading Malaysian universities perform relatively poor in global rankings. As an immediate action, further measures to improve university performance should be adopted (The World Bank, 2011). The top management in Malaysian Public Research Universities

including Universiti Malaya, Universiti Kebangsaan Malaysia, Universiti Sains Malaysia, Universiti Pertanian Malaysia and Universiti Teknologi Malaysia is aggressively designing and executing their strategic plan through PMS.

As an economic environment change, universities have to be proactive in planning and controlling their activities as they have to be responsible and accountable to the stakeholders. PMS is workable as a means to implement strategy, align behaviours and support decision-making to arrive at this objective.

2.2 Contemporary performance measurement system

Changes in social, economic and technology are forcing PMS to be contemporary. Despite its roles to produce positive changes in the organisational culture, understanding customer needs and perform strategic management roles, the roles of PMS have evolved to include continuous improvement, organisational learning and change management (Pinheiro de Lima et al., 2013). The attributes and use of PMS have significant indirect effects on the relationship between the differentiation strategy, environmental competitiveness and organisational performance (Amizawati, 2011).

Today, contemporary PMS comprises the use of financial and non-financial performance measures which link to the organisation's strategy. An example of contemporary PMS is balanced scorecard which advocates the use of an array of financial and non-financial measures (Cheng et al., 2007). It helps organisation to translate its strategies in executable results by combining resources and financial capacity. Franco-Santos et al. (2012) argued that a contemporary PMS exists if financial and non-financial performance measures are used to operationalise strategic goals. They assume that the role of PMS is to evaluate performance and comprise supporting infrastructure. Definitions by scholars highlight the importance of comprehensiveness and strategic link in PMS. Henri (2010) raises the issue of periodic revision on measures to reflect environmental changes. Therefore, in defining contemporary PMS, three elements should be applied: comprehensive, strategic and dynamic. It should consist of financial and non-financial measures, clearly linked to strategic objectives and reflect the surrounding environments.

2.3 Comprehensive performance measurement system

While discussing the appropriate use of PMSs and their effects, the fit between contextual factors and the design of management control systems is relevant to enhance organisational performance. To materialise it, the comprehensiveness of measurement is workable by integrating measures related to the four perspectives of the balanced scorecard (BSC): financial, customer, internal business processes and learning (Lee and Yang, 2011). Many companies use BSC as a framework to aid decision-making (Khan et al., 2011). In Australian local councils, a significant relationship exists between the use of multidimensional performance measures, link performance to rewards, training and teamwork with the effectiveness of PMSs (Baird et al., 2012).

In the literature, PMSs affect individual performance through cognitive and motivational mechanisms. A more comprehensive PMS can help managers to build new mental models of business unit operations (Hall, 2011b) and organisations need to consider the interactive effects of different performance measures in multi-task settings (Bol and Smith, 2011). In order to achieve a high level of comprehensiveness in PMS,

the organisations have to identify stakeholders and their interests, balancing of objectives, fit into the design and demonstrate the enabling role of management control system (Sundin et al., 2010). Comprehensive PMS is indirectly related to managerial performance through the mediating variable of role clarity and psychological empowerment (Hall, 2008). Reliance on multiple performance measures on subordinate managers' performance is contingent on goal uniqueness (Sholihin et al., 2010). An example of comprehensive PMS provides a broad range of performance information about different areas of organisation, a range of measures cover the critical area of departments operations, and a diverse set of measures related to the key performance areas of the organisation.

2.4 Strategic performance measurement system

Strategic PMS is designed to present managers with financial and non-financial measures covering different perspectives which provide a way of translating strategy into a coherent set of performance measures (Chenhall, 2005). If the strategy information is provided and all measures are strategically linked, the common measures bias is eliminated (Humphreys and Trotman, 2011). As the company pursues a different strategy, the use of more non-financial-based PMS has a positive effect on performance (Tsamenyi et al., 2011). Managers' assessment about the importance of the firm's strategic resource mediates the association between the importance of strategic resources and performance (Widener, 2006). In addition, the participatory development process increased employees' attitude and perceived social pressure and capability to take initiative among employees (Groen et al., 2012). In Spanish companies, a positive association between strategic PMS and organisational performance is mediated by the comprehensiveness of the strategic decision array (Bisbe and Ricardo, 2012).

There is a significant relationship between strategy, organisational structure and environmental uncertainty and the use of non-financial and process measures (Gosselin, 2011). However, output measures were commonly used than process measures among microfinance institutes (Waweru and Spraakman, 2012). The effect of performance measure use on financial strategic decision influence depends on two properties of the performance measures: decision-facilitating use and use for accountability (Artz et al., 2012). In the Netherlands, the alignment to environmental strategy is mostly achieved through the increased quantification of environmental measures (Perego and Hartmann, 2009). An example of strategic PMS is performance goals are explicitly linked to long-term strategies, a high degree of management involvement in the design and selection of the performance measures, uses measure related to strategy and PMSs offer assistance to organisational members which help them understand relationships between activities and functional areas.

2.5 Dynamic performance measurement system

Kennerley and Neely (2002) raised the need for PMS to be dynamic. Organisations should add, replace and drop certain PMS measures to incorporate changes in the organisation. According to Korhonen et al. (2012), performance measurement dynamism exists at four different levels: the dynamic role in the control package, the dynamism of PMS use in the dynamic which occurred, the dynamism of measure selection and the

dynamism of the components of single measures. The dynamic of PMS also exists when managers use broad-based performance measurement information for feedback and feed-forward control (Grafton et al., 2010).

An absence of dynamic PMS may be more harmful in a context of higher levels of change than to have dynamic PMS even if they are not required (Henri, 2010). Periodic revisions of performance indicators are necessarily made on the internal and external change. An example of dynamic PMS characteristics is the deletion and addition of indicators as reaction to environmental change, changes occurring in performance target and changes occurring in the definition of performance indicators.

3 Methodology

The study was conducted using a survey method. The sample consists of lecturers from Malaysian Public Research universities who were selected based on stratified random sampling method. The pilot study was conducted at the initial stage to check the appropriateness of the questionnaire. Four experts from top management universities also gave their comments on the items used in the questionnaire.

Questionnaires with self-addressed envelopes and stamps were distributed through university representatives. Respondents of the survey mailed their responses directly to the researchers. The questionnaire is divided into four parts: (a) background of respondents, (b) comprehensive PMS, (c) strategic PMS, and (d) dynamic PMS. Comprehensive PMS is measured with seven items adopted from Hall (2008), strategic PMS is measured with nine items adopted from Burney and Widener (2007) and Gimbert et al. (2010), and dynamic PMS is measured with four items adopted from Henri (2010). Table 1 summarises the instruments used to measure PMS.

Table 1 Performance measurement system (PMS) measures

Variable	*Construct*	*Items*	*Source*	*Scale*
Performance measurement system	Comprehensive	Seven items	Hall (2008)	1 – 'not at all' to 7 – 'to a great extent'
	Strategic	Nine items	Burney and Widener (2007) Gimbert et al. (2010)	1 – 'strongly disagree' to 7 – 'strongly agree'
	Dynamic	Four items	Henri (2010)	1 – 'never' to 7 – 'regularly'

A total of 1500 questionnaires were distributed and 384 questionnaires were returned representing 25.6% response rate. A total of 16 questionnaires were excluded due to incomplete responses, resulting in only 368 responses included in the final analysis. Table 2 summarises the response rate of the survey.

Table 2 Response rate

Items	*Number*	*Percentage*
Questionnaires distributed	1500	100
Questionnaires returned	384	25.6
Incomplete responses	16	1.1
Questionnaire useable for analysis	368	24.5

3.1 Data analysis

The data were analysed using a multivariate statistical that combines path analysis with Confirmatory Factor Analysis (CFA) (Hair et al., 2010). The SPSS application with AMOS add-on was used to construct the Structural Equation Modelling (SEM). Firstly, the Exploratory Factor Analysis (EFA) was performed to identify the number of items for each construct. Secondly, to test the factorial validity of the measurement models, three measurement models were tested using CFA. The measurement models were validated by obtaining estimates of the parameters of the models and by determining whether the model itself provides a good fit to the data.

3.2 Result

Table 3 shows the demographic profile of the respondents. Both male (49.7%) and female (50.3%) were represented in this survey. The respondents' age varied from the age group 25–30 to above 50. A total of 91.5% of the respondents were more than 36 years old. Most of the respondents (82.9%) had Doctor of Philosophy as their highest academic qualification. The respondents' current positions included lecturer (9%), senior lecturer (38.3%), associate professor (32.1%) and professor (20.7%). A total of 27.7% and 12.5% of the respondents had worked with the current university for more than 20 years and up to five years, respectively.

The reliability of each scale was tested using Cronbach's alpha and ranged from 0.770 to 0.955. Since these were above the 0.70 accepted threshold suggested by Hair et al. (2010), all items were kept under each scale. EFA using principal component method with varimax rotation was conducted on PMS variable to examine its dimensionalities. A total of three factors were extracted which explained a total variance of 71%. Three items were removed because of low communality (<0.6). Result of Bartlett test is significant ($X^2 = 5745.727$, $p = 0.000$, sig. $p < 0.000$) and score of Kaiser–Meyer–Olkin (KMO) is reported at 0.932. Table 4 shows the number of factors extracted from EFA and total variance explained. The factors are labelled as strategic PMS, comprehensive PMS and dynamic PMS.

Table 3 Profile of respondents

	Frequency (N = 368)	*Percentage*
Age (years)		
25–30	6	1.6
31–35	29	7.9
36–40	60	16.3
41–45	103	28
46–50	62	16.8
Above 50	108	29.3
Highest academic qualification		
Bachelor degree	1	0.3
Masters	33	9.0
Doctor of Philosophy	305	82.9
Professional/specialised	29	7.9

Table 3 Profile of respondents (continued)

	Frequency (N = 368)	*Percentage*
Job position		
Lecturer	33	9.0
Senior lecturer	141	38.3
Associate professor	118	32.1
Professor	76	20.7
Working experience in current university (years)		
1–5	46	12.5
6–10	69	18.8
11–15	83	22.6
16–20	68	18.5
Above 20	102	27.7

Table 4 Total variance explained

No.	*Factor*	*Eigen value*	*Variance explain*	*Total variance explain*
1	Strategic PMS	10.217	33.098	33.098
2	Comprehensive PMS	2.106	25.364	58.462
3	Dynamic PMS	1.913	12.717	71.180

The result of CFA for PMS is depicted in Figure 1. Based on standardised factor loading, items sp3, sp4, sp5 and cp1 were removed due to low factor loading. The model developed in this research had satisfied the criterion of Goodness-of-Fit Indices (GOF). Value of X^2/df is 2.643 which was less than 5, RMSEA 0.067 (≤0.08), SRMR 0.0408 (≤0.08), GFI = 0.938 (≥0.90), AGFI 0.909 (≥0.90), CFI = 0.974 (≥0.90) and TLI = 0.967 (≥0.90) (Hair et al., 2010). With respect to the quality of measurement model, the loading of items of the construct listed was all significant.

Table 5 lists the items under each factor. These results indicate the suitability and reliability of the data used for conducting factor analysis. The remaining measures were confirmed using CFA.

Table 5 Result of EFA (PMS)

Items	*Factor 1*	*Factor 2*	*Factor 3*
sp1	0.700		
sp2	0.770		
sp3	0.804		
sp4	0.832		
sp5	0.828		
sp6	0.818		
sp7	0.833		
sp8	0.829		
sp9	0.828		
cp1		0.817	

Table 5 Result of EFA (PMS) (continued)

Items	*Factor 1*	*Factor 2*	*Factor 3*
cp2		0.856	
cp3		0.848	
cp4		0.824	
cp5		0.790	
dp2			0.782
dp3			0.891
dp4			0.873

Three ways were used to verify the validity of the measurement. Firstly, this study had referred to previous studies as a guide to design the questionnaire items. In addition, four experts and academicians gave their comments for improvements. Secondly, this study had applied Fornell and Larcker's (1981) measure of Average Variance Extracted (AVE) to access the convergent and validity of the measurement. The AVE measures the amount of variance captured by construct through its items relative to the amount of variance due to the measurement error. The AVEs of the three constructs were more than 0.5 which proved that the convergent validity of the constructs was acceptable. Thirdly, to satisfy the requirement of the discriminative validity, the square roots of the construct's AVE must be greater than the correlations between the construct and other constructs in the model. The square roots of all constructs' AVEs in Table 7 of this study were all more than the correlations among all constructs. Tables 6 and 7 provide the results of the CFA and the discriminant validity.

Figure 1 Measurement model of PMS

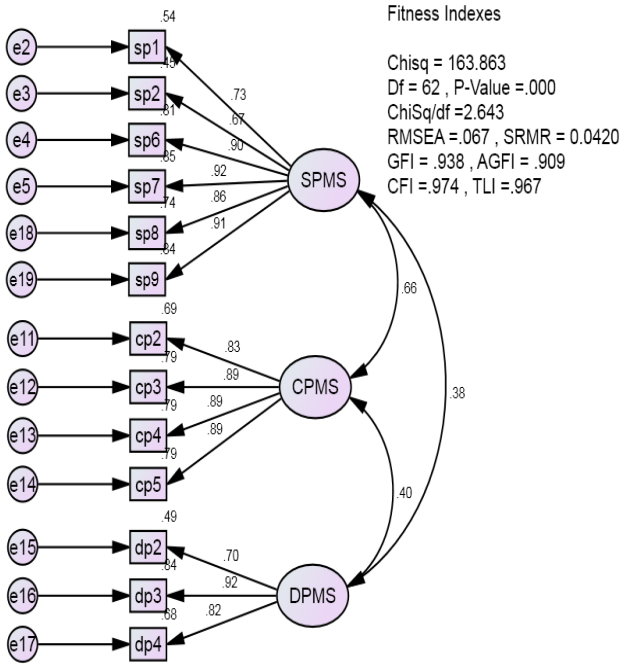

Table 6 CFA loadings, Cronbach's coefficients and AVE

Construct	*Items*	*Factor loading*	*Cronbach's alpha (>0.7)*	*Composite reliability (CR) (>0.6)*	*Average variance extracted (AVE) (>0.5)*
Strategic PMS	sp1	0.73	0.931	0.933	0.701
	sp2	0.67			
	sp6	0.90			
	sp7	0.92			
	sp8	0.86			
	sp9	0.91			
Comprehensive PMS	cp2	0.83	0.928	0.929	0.766
	cp3	0.89			
	cp4	0.89			
	cp5	0.89			
Dynamic PMS	dp2	0.70	0.849	0.857	0.670
	dp3	0.92			
	dp4	0.92			

Table 7 Discriminant validity

Construct	*SPMS*	*CPMS*	*DPMS*
Strategic PMS	0.837		
Comprehensive PMS	0.657	0.875	
Dynamic PMS	0.376	0.396	0.819

4 Discussion

The present study examined the university PMS and the result showed that all three dimensions of contemporary PMS – strategic as conceptualised by Hall (2008) and Chenhall (2005), comprehensive as discussed by Burney and Widener (2007) and Gimbert et al. (2010), and dynamic as raised by Henri (2010) – exist and are significant in public research universities in Malaysia. The top management must realise that PMS should be flexible and realistic as the university has to react to changes concerning economic, political and social aspects. In Malaysia, the Ministry of Education has carried out various efforts to improve the status of Malaysian higher education institutions as a centre of excellence in international education. For example, public universities are categorised into either research, focused, or comprehensive universities. In another development, the government grants autonomy status to public universities which meet the requirements. Financial allocation to these universities is given based on the performance of those institutions and code of governance and governance index has been developed to enhance accountability. Autonomy is also expected to expedite the transformation process of the university. Accelerated Programme for Excellence (APEX) was introduced with the underlying purpose to increase innovation, performance and encourage excellence among public universities.

The trend of corporate presence in private higher education intensified during the 1990s economic boom. Following the restructuring of the Malaysian higher education, the Malaysian private higher education sector has evolved into a binary system which is characterised by two categories of institutions: private universities and private colleges. By the year 2014, there were already 41 private universities, 28 private university college and 406 private colleges. The increasing number of private universities and colleges in Malaysia had also resulted in an extensive growth of foreign students. This phenomenon has also affected the university's top management in designing their strategic planning as well as PMS.

5 Conclusions and future research

The findings from this study contribute to the line of research in the area of PMS design especially in an educational setting. As an economic environment change, universities have to be proactive in planning and controlling their activities as they have to be responsible and accountable to the stakeholders. PMS is workable as a means to implement strategy, align behaviours and support decision-making to arrive at this objective. Therefore, the model developed in this research is usable for any higher education institutions as a guide to design their respective PMS.

In Malaysia, the Education Blueprint for Higher Education launched in April 2015 had set new targets such as to improve tertiary enrolment rates, to increase graduate employability and to increase international students. As a part to materialise the blueprint, the Malaysian government will give some of its control over the higher education to individual institutions which meet certain standards in a national regulatory framework. Public and private universities are to enjoy greater decision-making and, with this autonomy, institutions will be able to respond quickly to global education and trends.

Given the continuously evolving regulatory and competitive environment, the top management teams are expected to react positively in achieving institutional goals while satisfying multiple stakeholders such as students, parents, regulators and employees. This can be done through designing PMS in translating strategic goals. The process of planning requires the PMS to be strategically driven, comprehensive and proactive to reflect changes occurring in higher education. As a key player to help Malaysia become the hub of global higher education, it is a must for private universities to develop a contemporary PMS. Theoretically, a contemporary PMS has positive effects towards individual employee, business process and teamwork.

This study may be limited as the sample only included respondents from Malaysian public research universities. Generalisation cannot be made to other categories such as focused, comprehensive or even private universities. Future studies on PMS dimensions should incorporate other universities. The study did not discuss the behavioural aspects of PMS and relationship between PMS and performance of the respondents. Lastly, the survey method used in this study did not provide an explanation on how and why comprehensive, strategic and dynamic PMSs are used at the university. A case study approach might be able to enrich the findings from this survey by providing viewpoints of administrators and users of university PMS.

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