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A FRAMEWORK FOR ASSESSING THE EFFECTIVENESS OF PERFORMANCE MEASUREMENT PRACTICES

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Abstract

The effective application of performance measurement practices (PMP) is critical for achieving an outcomes-focus for the Queensland Government as it attempts to track the cause and effect between an agency's outputs and its ultimate impact on the Queensland community and its residents. Much of the research on assessing effectiveness has concentrated on determining factors that affect the level of effectiveness rather than on assessing the overall effectiveness of the practice itself. The need to evaluate effectiveness and the difficulty in operationalising the evaluation process requires a construct to be developed. This paper proposes criteria for assessing PMP effectiveness as well as a framework for operationalisation.

An analysis of the literature explored the critical dimensions and attributes of PMP. An expert panel was consulted to review the set of dimensions and attributes and to ensure content validity. Measurement of these attributes was realised through a questionnaire containing 19 initial attributes. The questionnaire was also pre-tested on experts and subsequently administered to participants from three agencies within the Queensland public sector. Construct validity was tested using an exploratory factor analysis to assess the degree to which the questionnaire accurately reflected the concepts that the research is attempting to measure. Comparison of the final attributes with the literature enabled refinement of the model of PMP effectiveness.

Planning is underway in the Queensland government for the implementation of this model to benchmark agencies and to improve PMP, thereby accelerating the rate of change in agencies' PMP and ensuring the successful implementation of Managing for Outcomes. The PMP effectiveness model provides a means of tracking trends and comparing PMP within and across agencies. It will provide an "as is" benchmark against which longitudinal assessments of change over time in PMP effectiveness will be evaluated.

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Introduction

The Queensland public sector is undertaking the initiative of reforming and adopting new management techniques associated with a performance management culture. A range of initiatives have been implemented across OECD member countries that aim to improve the accountability of the public sector and “as these reforms are maturing, the need is arising to go beyond the rhetoric of reform to look at the practicalities of implementing a results focus” (OECD, 2002: 3). These reforms are not aimed at the products of the public sector such as health care or education. Rather, they are attempts at changing the modes of managing, controlling and accounting for the actual production of such services (Brunsson & Sahlin-Andersson, 2000).

The Queensland public sector has been very clear about the importance of an outcomes-focused approach to the management and accountability of government. It represents a significant change to the way government programs are managed. More attention is paid to the way government programs are meeting objectives and less to carrying out activities and implementing processes. Government agencies are required to establish strategic objectives and determine the outputs needed to ensure government priorities and outcomes are met. The effective application of performance measurement practices (PMP) is critical for achieving an outcomes-focus for the Queensland Government as it attempts to track the cause and effect between an agency’s outputs and its ultimate impact on the Queensland community and its residents.

The effectiveness of PMP is a critical consideration for achieving a focus on outcomes for the Queensland government as they continue with the implementation of Managing for Outcomes (MFO). The effectiveness of performance measurement as a management accounting discipline is dependent on what and how information is provided (Bruns & McKinnon, 1993); yet effectiveness is a difficult concern to define let alone measure (Cameron & Whetton, 1983). The need to evaluate effectiveness and the difficulty in operationalising this evaluation process has led to various constructs being developed due to a lack of consensus on a set of useful and valid criteria.

Much of the research on assessment of effectiveness in the field of management accounting and performance measurement has concentrated on factors that affect the level of effectiveness rather than on the overall effectiveness of the practice itself. For example, Foster & Swenson (1997:110-111) reviews a body of success measurement relating to the implementation of activity based costing each of which uses a single-question or a composite of questions to develop success measures. Their review includes the following:

- Measures based on the use of information in decision-making (Innes & Mitchell, 1995);
- Measures based on decision actions taken with information (Innes & Mitchell, 1995);
- Measures based on dollar improvements resulting from use (Krumwiede, 1998);
- Measures based on management evaluation as to the overall success (Shields & Young, 1989).

This paper proposes criteria for assessing Performance Measurement Practice (PMP) effectiveness as well as a framework for its operationalisation. The need to evaluate

effectiveness and the difficulty in operationalising the evaluation process requires a construct to be developed. What are the dimensions of PMP effectiveness? How can these dimensions be operationalised?

This paper is presented in five sections. Firstly the literature relating to outcomes-based performance management is presented. Secondly the research methodology is described. An analysis of relevant literature is presented drawing on empirical studies to develop the PMP effectiveness model. The results of exploratory analysis are discussed comparing it with the literature. Finally this paper draws conclusions and discusses the implications of this research for future studies. It also discusses the implications of this research as a benchmarking tool for the Queensland public sector for assessing the effectiveness of PMP and to guide further implementation.

Outcomes-Focused Performance Measurement Framework

To manage resources effectively towards an intended outcome, public sector agencies need performance information about the programs they deliver. Such performance information permits an assessment of whether the expected outcomes and agency outputs are being achieved. Under the outcomes-focused approach to managing the public sector, elected officials, senior government officers and managers are required to make decisions considering what the government programs are achieving for the community. Managing requires long term strategic planning towards stated objectives while operating complex systems and processes on a day-to-day basis. Managing also requires reviewing activities and the outputs of activities to ensure that they remain appropriate for achieving the outcomes expected by government.

The managing for outcomes (MFO) process is a comprehensive and integrative planning, budgeting and performance management approach that begins by focusing an agency on its mission, goals, and objectives. It establishes the accomplishment of those goals and objectives as the primary aim for the organisation and it requires the establishment of performance measures and the use and reporting of those measures so that management, elected officials, and the public can assess the degree of success the agency is having in accomplishing its mission, goals, and objectives. Practical guidance for implementing the process is well documented [Queensland Treasury, 1997; Treasury Board of Canada, 2001; Campbell Public Affairs Institute, 2002]. Adopting outcomes-based management presents some challenges for the Queensland public sector. First, outcomes must be defined in precise, preferably measurable terms. Second, different types of measures should be used to monitor trends and measure the impacts of an agency's interventions.

Many measures commonly used in public sector organisations adopt an input oriented perspective, usually expressed in terms of cost, budget and staffing. Generic measures used include items such as cost per case, cost per service type, which can be translated into specific measures such as cost per patient or unit cost per service, etc (Boland & Fowler, 2000). Such measures provide little information about the real success, or otherwise, of the agency. An increase in the number of outputs, for a given input, simply demonstrates how efficiently an organisation is converting its inputs into outputs but provides very little information about the effectiveness or value of these outputs. Public sector organisations are created to meet some perceived societal need. Effectiveness, these authors suggest, is concerned with the extent to which outputs meet societal needs and is therefore much more difficult to assess, let alone measure.

According to Friedman (2003), the development of an effective performance measurement system should be aligned to an accountability framework that distinguishes between “*outcomes-based*” systems and “*performance-based*” systems. Based on Friedman's writing,

accountability based on outcomes such as the well being of the Queensland population cannot be assigned to any single agency. The safety of Queenslanders, for example, is not the sole responsibility of a specific agency. It is by definition a shared responsibility. However, performance-based accountability can be assigned to a particular agency and is concerned with accountability for the performance of a particular program or activity.

The principal distinction between the two types of accountability is between 'ends' and 'means'. Outcomes-based accountability concerns the 'ends' the government wants for Queenslanders and their community. Performance-based accountability deals with the 'means' to get there and what agencies do as they work towards achieving those outcomes (Friedman, 2003). Thus, agency activities and outputs should lead to a set of different outcomes, which should logically fit together to achieve the Government's strategic long term outcomes.

The Queensland Model – Managing for Outcomes (MFO)

The Queensland Government performance management framework is described as an "accountability framework for public sector service delivery". "It defines the strategy for focusing effort across the public sector in delivering outcomes and services and the strategic points at which performance is measured and reported to government and the community" (Queensland Treasury: 1997). The government establishes a set of outcomes, which "set the broad frame for government decision making and funding determinations". Outcomes represent the dimensions of well being (social, economic and environmental). Outcome indicators and key outcome measures are developed which attach to each outcome and define the parameters with which success in achieving the outcomes will be determined.

Under this framework, government agencies are required to relate their outputs to the set of government outcomes. Links between agency inputs and outputs complete the framework, which assists decision makers in their assessment of whether government services and resources are aligned with the government's desired outcomes. A set of outcome indicators is established enabling the government to measure its success in achieving outcomes. This measurement and reporting process purports to assist decision-makers in their determinations regarding the appropriate mix of outputs in delivering the desired results. Output measures assist in the monitoring of output performance. The Queensland MFO model provides for the specification of outputs for its agencies. According to Queensland Treasury (2002) an output should be specified such that (i) it describes the type of service to be delivered; (ii) identifies the recipients of the service or activity; and (iii) states the intended result of the activity. The cause and effect between an agency's output and its ultimate impact is tracked through performance measures.

Research Methodology

Various empirical studies conducted in the field of management accounting and performance measurement have examined critical factors affecting the effectiveness of the implementation of techniques. Assessments of the overall effectiveness of such practices are extremely limited within these disciplines. In contrast the disciplines of organisational theory and information systems have a deep history in developing measures of effectiveness. For this reason this research draws on empirical work in these disciplines to develop a model for measuring the effectiveness of PMP. Accordingly, an exploratory research approach is adopted incorporating the following steps:

- An analysis of the literature to explore the critical dimensions and attributes of PMP and identify means for operationalising them for assessment purposes. An expert panel was consulted to review the set of dimensions and attributes and to ensure content validity;

- The development of a questionnaire containing 19 initial attributes. The questionnaire was also pre-tested on experts and subsequently administered to participants from three agencies within the Queensland public sector;
- The conduct of an exploratory factor analysis to assess the degree to which the questionnaire accurately reflects the concepts that the research is attempting to measure; and
- The refinement of the model of PMP effectiveness through subsequent comparison of attributes with the literature.

An iterative process in which data informs construct definition and refinement was adopted (Comrey, 1978). Selection of attributes to be retained in the model was guided by theory and/or the findings of past research (Goldberg & Digman, 1994). Consequently the PMP effectiveness model started with a pool of attributes drawn from a literature review. Content validity was tested through an exhaustive literature search, as well as a review by an expert panel to ensure the inclusion of relevant attributes in the model.

The proposed dimensions and associated attributes of PMP effectiveness were tested using a questionnaire (Miriani & Lederer, 1998). Personal interviews with an expert panel were held to improve the questionnaire in terms of overall readability, format, and the relevance of the questions to the theoretical propositions. The questionnaire was edited and re-edited for each successive interview (Choe, 2002). The questionnaire was subsequently administered to 102 respondents from three agencies within the Queensland public sector.

Three Queensland Government agencies were selected as the context from which individuals were selected to participate. The selection of two cases, Agency A and Agency B, was made based on features including similar funding sources, alignment to the same Government outcome, existence of employees with experience in the implementation of MFO, existence of key employees who have played a leadership role in the development of the MFO framework, and the existence of observable commitment by key employees to MFO. Agency C possesses particular characteristics of interest to this research. It provides a leadership role to the Queensland Government for the implementation of MFO. Agency C is responsible for setting government policy in relation to outcomes-based performance management and provides assistance to other agencies in implementing this policy.

Individual employees from the Agencies A and B were purposively selected for inclusion in this research on the basis of their organisational characteristics providing perspectives from different levels in the corporate hierarchy and from different functional areas (Anderson, 1995). Selection was also based on employees' multiple exposures to PMP through current and prior experience, seminars, in-house training, etc. Thus respondents had reasonable knowledge about PMP. Individual employees from Agency C were selected on the basis of their expertise and experience in providing assistance to either Agency A or B in the implementation of MFO. 102 employees from the three agencies participated in this research by returning the questionnaire correctly completed.

The questionnaire recorded the perceptions of respondents towards the issues identified in the research utilising a five-point Likert scale anchored at 1 = 'never' and 5 = 'always'. Each respondent from Agency A and B was asked to circle the response which best described their opinion about certain aspects of the practice within their agencies. Respondents from Agency C were asked to circle the response which best described their opinion about the same aspects of the practice within each of the Agency A or B.

Prior to administering the questionnaire, the researcher explained the structure of the instrument and the method used to answer the questions (Choe, 2002). The researcher also provided clarification as to the various PMP practices and respondents were given a glossary of terms for reference while completing the questionnaire.

The analysis of questionnaire data was guided by the objective to explore the nature of the attributes of PMP effectiveness and the relationships between them. Thus an exploratory factor analysis (EFA) was conducted which explored construct validity (Huitt, 1998). Refinement of the model of PMP effectiveness involved the retention of attributes which correlated significantly with a factor that was extracted by the EFA analysis.

Assessing PMP Effectiveness

Effectiveness is a difficult concept to define and measure (Cameron & Whetton, 1983). The need to evaluate effectiveness and the difficulty in operationalising this evaluation process has led to various constructs being developed by various researchers. There is a general lack of consensus on what constitutes a set of useful and valid criteria.

Definitions of Performance Measurement Concepts

To guide research efforts, the concepts being investigated must be clearly defined. Clear definitions of concepts are also necessary to ensure construct validity of the measurement tool developed (Cronk & Fitzgerald, 1999). Consequently, definitions of “performance measurement practices” and “effectiveness” will facilitate the development of an instrument for measuring PMP effectiveness.

Several definitions of the term “performance measurement” have been proposed in the literature [Neely, Gregory & Platt, 1995; Hatry, 1999; Brown, Stillwell & McKinney-Gonzales, 2005]. Put simply, performance measurement is defined as a technique to enable assessments to be made of the results of action, the effective use of resource, and the degree to which actions meet policy goals and objectives (Brown, Stillwell & McKinney-Gonzales, 2005).

The literature also offers several definitions of “performance measurement practices” [USAID, 2005]. This research adopts the following definition of PMP:

PMP refers to the systematic use of performance measurement techniques whose aim is to manage organisational performance.

Definition of Effectiveness

Defining the term “effectiveness” is much more problematic than defining “performance measurement”. For example, the dictionary definition¹ of the term “effectiveness” is “*having an intended or expected effect*”; “*producing or capable of producing a desired effect*”; and “*able to accomplish a purpose*”. The term “effectiveness” is synonymous with the term “success” which is defined as “*the achievement of something desired, planned, or attempted*”; “*a result or an outcome*”; and “*the outcome of effort*”. Defining “effectiveness” requires more than simply referring to the dictionary for guidance. For example, “effectiveness” is also defined as:

- the “extent to which outputs meet organisational needs and requirements” (Boland & Fowler, 2000);
- “performing the right tasks to achieve desired results” (McNurlin & Sprague, 1989); or
- describing “how well a programme is achieving its stated goals or other effects” (Symons, 1991).

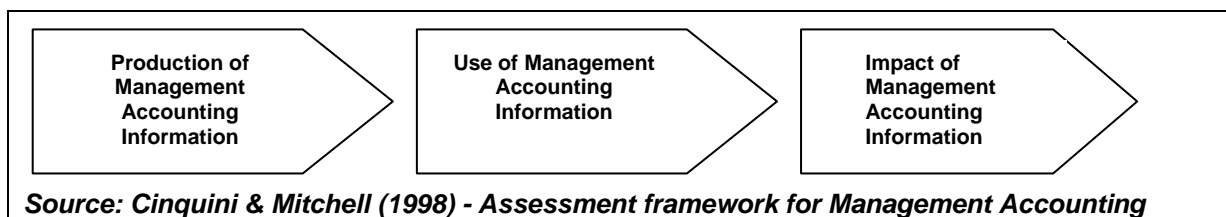
¹ *Roget's Interactive Thesaurus, First Edition (v 1.0.0), Lexico Publishing Group, <http://dictionary.reference.com/>*

This research adopts an organisational perspective in defining effectiveness. Thus, the definition used for this research is:

Effectiveness is defined as performing the right tasks to ensure that desired results are achieved.

Within the discipline of management accounting the focus for determining effectiveness varies greatly. For example, a body of research focuses on implementation success of activity-based costing (Chenhall & Langfield-Smith, 1999); on the perceived benefits associated with the use of information (Cavalluzzo & Ittner, 2004); on the extent to which systems provide information (Mia & Chenhall, 1994); and on the process for determining the level of success of management accounting systems [Cinquini & Mitchell, 1998]. In relation to performance measurement much focus has been on implementation success and failure of balance scorecards (Neely & Bourne, 2000); establishing criteria for successful performance measurement systems (McNamara & Mong, 2005); and assessments as to which performance measurement systems are utilised (Byrne, Gordon & Jeffers, 2002).

The Cinquini & Mitchell (1998) approach to determining effectiveness recognises three aspects of management accounting practices, indicating a variety of evidence may be used to measure their effectiveness. These aspects are based on the key stages in the process and are shown below:



In this sense, management accounting information flows through a series of stages from its production through its use and to its impact or influence on the organisation. Defining the stages of PMP in the same way permits clearer understanding and identification of dimensions of “PMP effectiveness” and the relationships between these dimensions (Ballantine, Bonnier, Levy, et al, 1996). These stages suggest that such dimensions are likely to have (i) a production or technically dependent dimension whereby effectiveness may be reflected in measures such as the quality of performance measurement information; (ii) a user dependent dimension which may be reflected in measures such as the perceived usefulness of performance measurement information; and (iii) an organisation dependent dimension which may be reflected in measures such as the impacts on decision making, accountability levels, etc. Consequently, the measurement of effectiveness of PMP must endorse a process perspective and consider the means and ends of the practice.

Attributes of PMP Effectiveness

Much of the research surrounding assessment of effectiveness conducted in the field of management accounting and performance measurement has concentrated on assessing factors that affect the level of effectiveness rather than on assessing the overall effectiveness of the practice itself.

The need to evaluate effectiveness and the difficulty in operationalising this evaluation process has identified a need for a construct to be developed. This research is concerned with defining the dimensions of PMP effectiveness and describing how these dimensions

may be operationalised. In the absence of empirical studies to assist in the selection of attributes contributing to measuring PMP effectiveness, literature and empirical studies from the disciplines of information systems provide insights into attributes that generally contribute to a set of criteria for assessing effectiveness.

DeLone & McLean (1992) in developing their Information Systems Success Model began with a definition of information as the output of an information system, which could be measured at the different stages of production, use and impact of information. These authors attempted to reflect in their success measurement model the interdependent process nature of information system success. The DeLone & McLean constructs have been repeatedly questioned in the information systems (IS) literature with some parts of the model being validated and others not (Drury & Farhoodmand, 1998); and with some studies claiming the model creates interpretational confusion (Rai, Lang & Welker, 2002). Regardless of these the DeLone & McLean model provides a sound basis for classifying the measures of IS success into plausible groupings and for this it has intuitive appeal for this particular research (Ballantine, Bonner, Levy, et al, 1996). The general approach recommended by DeLone & McLean best reflects the interdependent process nature of PMP described in the earlier section of this chapter.

Thus the model of PMP effectiveness used in this research refers to the interdependent relationship amongst the different stages or processes of PMP. This interrelationship is defined as:

The production of performance measurement information *affects* the usefulness of performance measurement information, which is a *direct antecedent* of the impact of performance measurement information.

This interrelationship permits a review of literature on the production, usefulness and impact of PMP to explore the critical dimensions of the PMP process and to identify means for operationalising them for assessment purposes.

Quality

According to Drury & Farhoodmand (1998) “an organisation is viewed as an economic entity engaged in the production process”. As part of this process organisations rely on the quality of raw data and the correctness of data processing activities that ultimately determine the information products delivered to users. Thus organisations would obviously prefer that their information outputs be of the highest quality (Ballou, Wang, Pazer, et al, 1998).

The field of information systems and technology provides empirical evidence [DeLone & McLean, 1992; Drury & Farhoodmand, 1998; Gable, Sedera & Chan, 2003] to support inclusion of the dimension of the quality in an assessment of effectiveness with several providing guidance for its measure (Kahn, Strong & Wang, 2002; Ballou, Wang, Pazer & Tayi, 1998; Gable, Sedera & Chan, 2003; Bovee, Srivastava & Mak, 2003) and with some pointing to interpretational confusion in these attributes (Bovee, Srivastava and Mak ,2003; Gable, Sedera & Chan, 2003).

The measures of quality are those that capture criteria from the information production process (Bovee, Srivastava & Mak, 2003). Stated simply, PMP provides useful information to managers, which involves the generation or production of data and transforming it as useful information. However, quality of information does not exist in the absence of its relevance to users and the organisation. “Information itself does not exist except when used for a purpose” (Ballantine, Bonner, Levy, et al, 1996:7). According to Juran, Gryna and Bingham

(1974), quality may be defined as fitness for use or the extent to which an information product successfully serves the purposes of its users. However, measuring fitness for use is a difficult task (Kahn, Strong & Wang, 2002; Bovee, Srivastava & Mak, 2003) and if quality means fitness for use, then it cannot be measured in isolation from the usefulness it provides, that is, its purpose (Ballantine, Bonner, Levy, et al, 1996). Consequently, **purpose** is proposed as an important attribute for this research.

While it has been acknowledged that information quality is not an exact science, there remains the critical need to assess how well organisations develop information products and deliver information to their users (Kahn, Strong & Wang, 2002). The classification of quality attributes is subjective in nature (DeLone & Melone, 1992). This research proposes the following set of attributes related to data and information quality:

Users will employ data and information that is **accurate, timely** and **current** when they perceive it to be **accessible, understandable, relevant**, sufficient in its **scope, concise**, have **integrity** and be believable and is suitable for its **purpose**.

Efficiency and Systems Integration

Users of information do not distinguish clearly between the quality characteristics of information and quality characteristics of the software systems that deliver that information (Kahn, Strong & Wang, 2002). Information systems with integrated databases enable users to identify, access, integrate and interpret required data (Goodhue, 1995). Furthermore, efficiencies in the production of performance measurement information may be demonstrated through the use of information technology (DeSeve, Pesachowitz & Johnson, 1997).

Considering this, organisations relying on performance measurement information are now better equipped to use information originating from a variety of information systems. Such integration in information systems should improve efficiencies in the production of information (Gable, Sedera & Chan, 2003) and hence the quality of data and information. Consequently **information system integration** is proposed as an attribute of PMP effectiveness.

Innovation

Put simply, “innovation is a new idea” (Van de Ven, 1986: 591) and “the ability to improve an information service, will, in part, depend on the capacity to innovate” (Cinquini & Mitchell, 1998: 8).

While DeLone & Melone (1992) do not discuss the impact of innovation, several researchers have considered likely impacts (Ballantine, Bonner, Levy et al, 1996; Gable, Sedera & Chan, 2003). Data produced by PMP enables organisations to review their existing activities through better understandings of those activities. Consequently, this research proposes the attribute of **innovation** be incorporated in the model for measuring the effectiveness of PMP.

Use of Performance Measurement Information

While DeLone & Melone (1992) advocates “use” as an attribute in their model, several studies have demonstrated significant concerns regarding its inclusion. For example, Gable, Sedera & Chan (2003) argues that the “use” factor is an inappropriate measure of effectiveness, while Bruns & McKinnon (1993), argues that, “the qualifying adjective of

'useful' introduces the morass of issues concerned with the nature of managerial work and the psychological processes inherent in decision-making". Furthermore, "when a system is mandatory, the extent of the use of a system conveys little information about the success of the system" (Gable, Sedera & Chan, 2003: 580). A more appropriate construct according to Gable, Sedera & Chan (2003:580) is to gauge usefulness, rather than usage or use – "usefulness derives from such factors as the quality of the system and information it produces". Consequently the inclusion of the attribute "use" would produce "muddled thinking" (Ballantine, Bonner, Levy, et al, 1996) and for this reason has been excluded from the attributes proposed by this research.

Impact of Performance Measurement Information

In its simplest form, "performance measurement is the process of quantifying elements which impact on organisational objectives, management control and evaluation" (Wilson, 2000).

A critical issue is determining what constitutes performance. This requires examination of the goals of the organisation (Cinquini & Mitchell, 1998; Chenhall, 2003) and according to Chenhall (2003:136) "linkage between [the PMP] and organisational goals is explicit, as a primary function of [the PMP] is to measure progress towards achieving desired organisation ends".

Some commentators claim that the outcomes should be elements of desired organisational or managerial performance (Otley, 1980; Otley & Wilkinson, 1998). Other authors claim that the evaluation of PMP should determine the extent to which PMP accommodates the following:

- Evaluation in terms of efficiency and effectiveness (Cavalluzzo & Ittner, 2004); and in terms of overall performance (Berliner & Brimson; 1988) capturing both financial and non-financial outcomes (Neely, Gregory & Platt, 1995);
- Organisational learning [Ballentine, Bonner, Levy, et al, 1996; Burke, 2005];
- Greater accountability [Hatry, 1999; Cavalluzzo & Ittner, 2004];
- Enhanced decision-making [Cavalluzzo & Ittner, 2004];
- Benchmarking [Magd & Curry, 2003]; and
- Performance reporting including multi-dimensional capabilities [Heeks, 1998].

Accordingly, this research proposes the attributes of **evaluation, decision-making effectiveness, reporting and monitoring, organisational learning, benchmarking** and **accountability** to be included in the model for assessing the effectiveness of PMP.

The Assessment Criteria

The review of empirical studies and literature has identified models and frameworks of possible relevance in developing an initial construct of PMP effectiveness. Initial dimensions and relevant attributes proposed by this research to assess the effectiveness of PMP are shown in Figure 1 below.

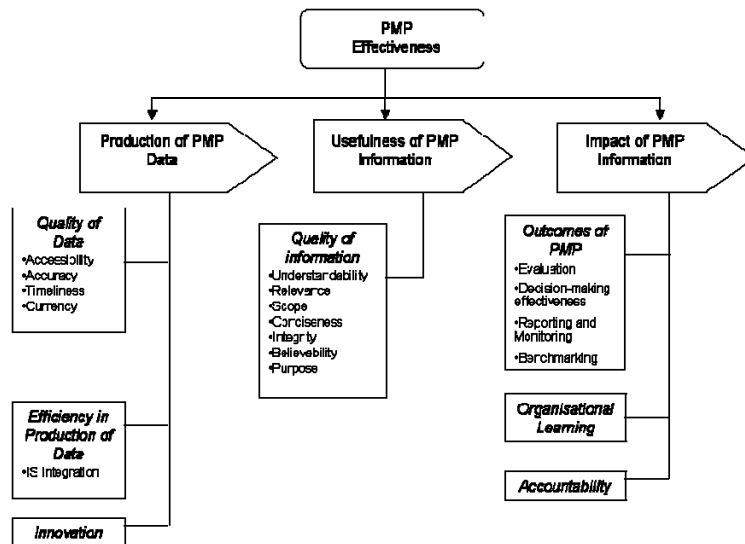


Figure 1: Initial Model of PMP Effectiveness

While the classification of attributes is highly subjective, the logical classification permits this research to describe the relationship between these attributes as follows:

The Production of Performance Measurement Information (Data Quality, Efficiency, Innovation,) affects the Usefulness of Performance Measurement Information (Information Quality), which is a *direct antecedent* for PMP Impact (Outcomes, Organisation Learning, Accountability).

An expert panel reviewed the initial set of attributes in order to enhance content validity. The dimensions and associated attributes of PMP effectiveness were tested through a questionnaire, and administered to **102 respondents** from three Queensland government agencies. An iterative process, employing an exploratory factor analysis, informed the construction of the model of PMP effectiveness. Refinement of the model of PMP effectiveness involved the retention of attributes, which correlated significantly with a factor that was extracted by the EFA analysis.

Results and Discussion

The research methodology served to explore the nature of the dimensions and associated attributes of PMP effectiveness and the relationships between them. This research provides an indication of the number of factors involved in the PMP effectiveness construct and recognizes that future analytic studies will allow refinement of the model.

The test for construct validity involved conducting an EFA to explore the nature of the dimensions of PMP effectiveness and the relationships between them (Tucker & MacCallum, 1997), and to condense the original attributes of PMP effectiveness into a smaller set of attributes without the loss of information (Conway & Huffcutt, 2003).

Employing an attribute to cases ratio of 1:5.26, which fits well with the recommended approach to applying EFA (MacCallum & Tucker, 1991), the analysis applied the following steps (DeCoster, 2003):

- (i) Examine the correlation matrix. Where correlations between the initial set of attributes exceeded 0.3, the item was retained (Monash University, 2005).

- (ii) Select the number of attributes to include in the analysis by removing unsuitable items. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test of sphericity were applied iteratively to the data to assess which attributes needed to be dropped from the model because they are too multicollinear. An overall KMO score greater than .60 and a Bartlett's test showing strength in the relationships amongst attributes indicated adequacy to proceed to factor analysis (Garson, 2005).
- (iii) Extract an initial set of factors. This analysis conducted a scree test (Cattell, 1966) to visually locate an elbow, which can be defined as the point where the eigenvalues form a descending linear trend.
- (iv) Rotate the factors to a final solution. The factors were rotated using Varimax Rotation to clarify the factor pattern and improve the interpretation of the nature of the factors and to produce a simple structure (Abdi, 2003). As many attributes tended to load on more than one factor (Reise, Waller & Comrey, 2000), interpretation of the loadings was based on an arbitrary rule of thumb, which retained attributes with loadings of more than .6 (Garson, 2005); and
- (v) Interpret factor results - Interpreting and naming these factors involved attempts to describe what the accepted attributes for each factor have in common. Comparisons with the literature served this function.

Following removal of unsuitable items from the original set of attributes, the KMO statistic of .776 was determined. This score is regarded as a "middling" degree of common variance among the attributes (Friel, 2005) indicating that a fair amount of variance, but not all of it, will be accounted for when the factors are extracted. The observed significance level, as indicated in the Bartlett's test, is 0.000, which is small enough to reject the hypothesis that the attributes in the population correlation matrix are uncorrelated. Factor analysis was subsequently conducted using the remaining set of attributes. 13 factors were extracted, which was the same as the number of attributes factored.

Given concerns expressed in the literature regarding the extraction of only those factors with one or larger eigen values (Reise, Waller & Comrey, 2000; Hayton, Allen & Scarpello, 2004), this analysis employed a scree test (Cattell, 1966) to visually locate an elbow or point where the eigenvalues form a descending linear trend. The scree plot for this analysis is presented in Figure 2.

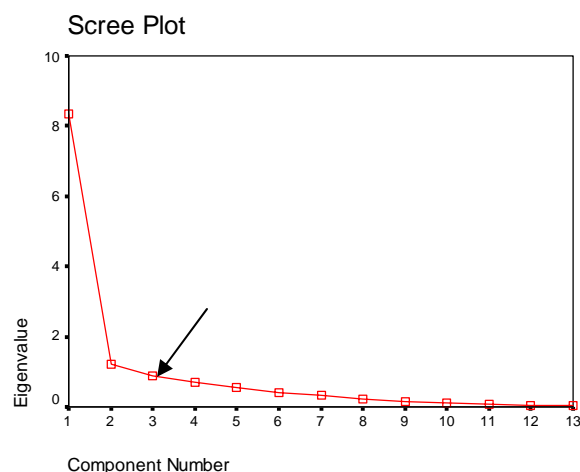


Figure 2: Scree Plot

A descending trend does not appear until after the 3rd factor. Consequently this research employed a three-factor solution where 80.302% of the common variance shared by the 13 attributes is accounted for by these 3 factors. Varimax Rotation was applied with resultant factor loadings determining the attributes to be retained in the model. Focusing on designing a simple structure for PMP effectiveness was not easy because many attributes tended to

load on more than one factor (Reise, Waller & Comrey, 2000). This research retained only those attributes which contributed to a high degree to the formation of a given factor. Attributes were retained which have loadings of more than .6 (Garson, 2005). Hence all the remaining 13 attributes are retained in the model.

The literature was referred to in order to apply meaning to these factors. This analysis of the model constructs suggests the existence of three important dimensions of PMP effectiveness with attributes sharing common themes. The constructs are shown in Table 1.

Factor 1	Factor 2	Factor 3
Integrity	Access	Decision-Making Effectiveness
Scope	Understandability	Organisational Learning
Timeliness	Relevance	Accountability
Currency		
Conciseness		
Accuracy		
Believability		

Table 1

This suggests the need to re-group attributes associated with Quality of Data and Quality of Information. Reference to the literature suggested that these three factors may be named Production of PMP Data, Usefulness of PMP Information, and Impact of PMP Information respectively. Figure 3 below depicts the revised model of PMP effectiveness.

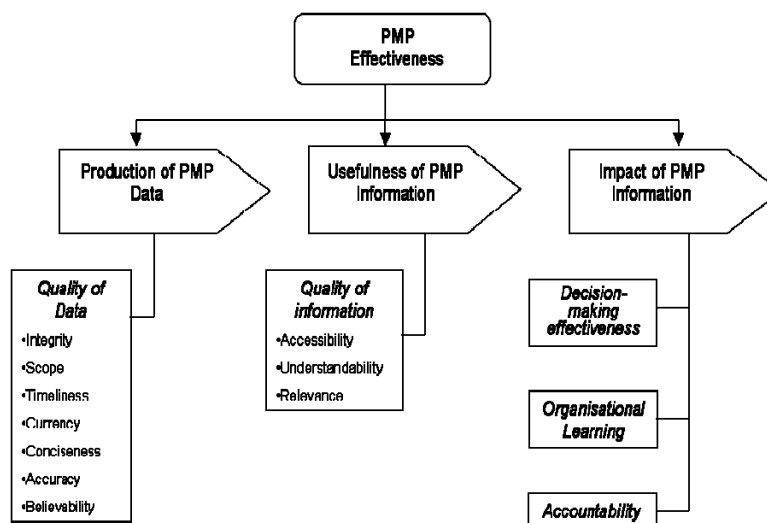


Figure 3: Revised Model of PMP Effectiveness

Conclusions

This research developed a model for assessing PMP effectiveness. This research has been exploratory in nature. This involved identifying relevant dimensions and an initial set of attributes, which were tested for content validity and construct validity. A revised model of 13 attributes was proposed. Attributes proposed were:

- Quality of Data: Integrity; Scope; Timeliness; Currency; Conciseness; Accuracy; Believability
- Quality of Information: Accessibility, Understandability; Relevance; and
- Decision-making Effectiveness; Organisational Learning; and Accountability.

The logical classification of attributes permits this research to describe the relationship between these attributes as follows:

The Production of PMP in terms of its Quality of Data (Integrity; Scope; Timeliness; Currency; Conciseness; Accuracy; Believability) affects the Usefulness of PMP in terms of its Quality of Information (Accessibility, Understandability; Relevance), which is a *direct antecedent* for PMP Impact (Decision-making effectiveness, organisation learning, accountability).

Further research in PMP effectiveness is recommended concerning the range of attributes selected for this initial model. Potential interrelationships amongst attributes should be investigated to establish their usefulness in theory and application.

The model of PMP effectiveness may be used as a benchmarking tool in terms of how well PMP operates within the Queensland public sector and to assess the maturity of the Queensland public sector agencies in the implementation of MFO. Benchmarking is a process for finding and implementing best practices and can be an effective tool for improving PMP processes. This may accelerate the rate of change required in agencies' PMP and ensure the successful implementation of MFO. The model may offer the Queensland public sector a practical means for assessing the effectiveness of PMP.

Planning is underway in the Queensland government for the implementation of this model to benchmark agencies and to improve PMP. The benchmarking process is not meant to diagnose the actual cause of problems associated with PMP. It provides a means of tracking trends and comparing PMP within and across agencies. Initial mean scores on attributes will provide an "as is" benchmark against which longitudinal assessments of change over time in PMP effectiveness will be evaluated (Gable, Sedera & Chan, 2003).

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