

AHP Analysis of Key Influential Factors for Hospital Pharmacy Management

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ABSTRACT

Hospital pharmacies are primarily responsible for managing pharmaceutical safety practices, drug consultations, clinical pharmaceutical services, and pharmaceutical administrations. Public hospital pharmacies are currently in lack of an effective set of management criteria because the public hospital system differs from those of other non-profit organizations and public hospital pharmacists generally suffer exceptionally heavy workload. This phenomenon has resulted in poor solidarity and increasingly severe shortage of talents in public hospital pharmacies. To address the issue of talent shortage, this study adopts the method of Analytical Hierarchy Process (AHP) to identify the key influential factors for the success of hospital pharmacy management. Various perspectives/dimensions based on the balanced scorecard approach help hospital pharmacy managers improve management quality, facilitate operation procedures, and solve the problem of pharmacist shortage. This study's findings suggest that the internal business process perspective is the most important perspective for hospital pharmacy management, which is followed by the learning and growth perspective and the financial perspective.

Keywords: Hospital pharmacy management; Pharmacist shortage; Analytical Hierarchy Process; Balanced Scorecard.

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1. INTRODUCTION

Pharmacists generally enjoy a wide range of employment opportunities – they can be hired as hospital pharmacists, community pharmacists, clinical pharmacists, and pharmaceutical industry practitioners. The 2014-2016 Survey Report on the Professional Talent Demand in the Biotechnology and Pharmaceutical Industry published by the Taiwan Ministry of Economic Affairs reveals that the most sought-after pharmaceutical talents are those specialized in R&D (17%), manufacturing (46%), and business marketing (30%). The experience of practicing in a hospital is extremely important to a pharmacist's career path (Ong *et al.*, 2019). However, the supply of hospital pharmacists has been decreasing in Taiwan since 2010 (Salameh *et al.*, 2007). Apart from the availability of alternative job opportunities, the main causes of the shortage of hospital pharmacists are the low salaries, the high pressure at work, the

complex job nature, and the requirements of night shifts and overtime work on holidays at hospitals (see Table 1). If hospitals fail to propose effective policies for tackling the problem of pharmacist shortage, this on-going problem might hinder Taiwan's long-term economic and social development (Gedeshi *et al.* 2006; Ma *et al.*, 2015).

Table 1. The comparison of the work nature of Taiwan's pharmacists

	Hospital pharmacist	Community pharmacist	Clinical pharmacist
Salary	Low salary + High performance requirement	High salary + bonus	High salary
Job nature	Complex + Teaching evaluation + Night shifts	Simple + Marketing	Simple

Source: Pharmacist recruitment contents from job banks.

There are nine Taiwan universities with a school of pharmacy, from which over 1,000 pharmacy students graduate each year. The admission rate of pharmacy schools ranges from 30% to 60%. Hospital pharmacists in Taiwan have to shoulder complicated responsibilities, roles, and missions such as preparation of hospital evaluations, writing medical case reports, undertaking on-the-job training, conducting pharmaceutical research, and attending domestic and international conferences. As the supply of hospital pharmacists has been declining, it is important to develop a strategic model from the institutional perspective for encouraging pharmacy students to be committed to their profession (Chu *et al.*, 2009). The objective of this study is to identify the key factors for successful pharmacy management.

Hospital pharmacy management covers drug procurement and distribution, prescription dispensary, personnel management, and quality improvement processes. However, pharmaceutical education does not provide sufficient training on professional managerial skills (Kaufman, 1988). In contrast, American Pharmacists Association (APhA) provides comprehensive courses to pharmacy managers covering personnel management, drug administration, medical quality management, and pharmaceutical teaching and training (Talley, 2005). To retain hospital pharmacists, it is therefore important to establish a comprehensive management system for hospital pharmacy (Faris *et al.*, 2005).

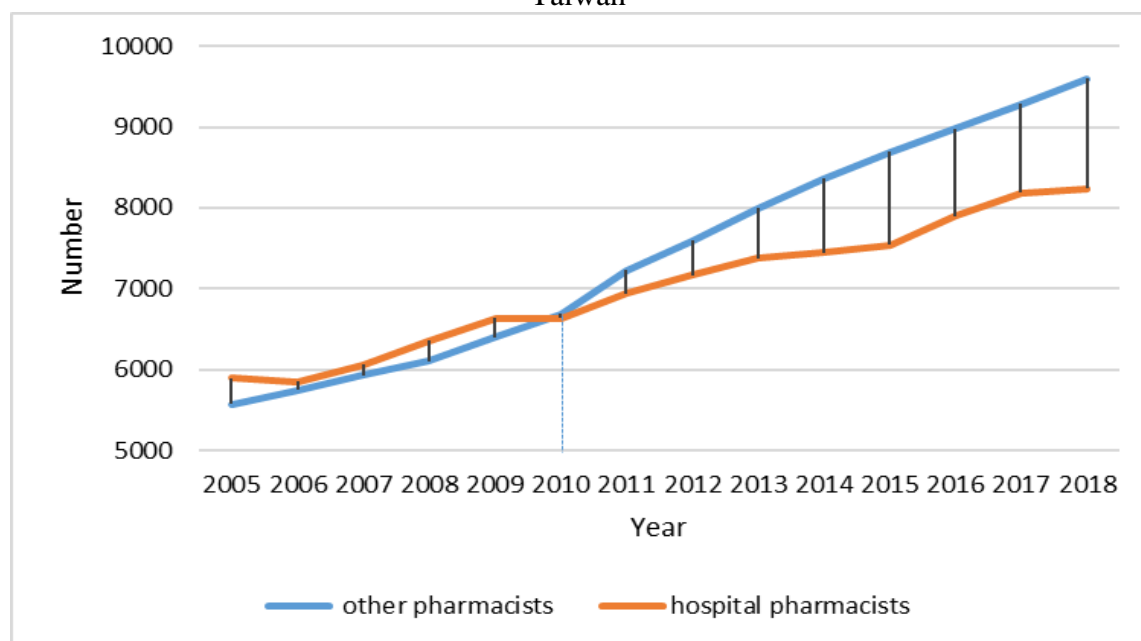
2. LITERATURE REVIEW

2.1 The Development of Pharmacology and Hospital Pharmacy in Taiwan

The mission of Taiwan's pharmacy education is to train qualified pharmacists so as to ensure medication safety, meet the local demand for pharmaceutical services, and make Taiwan's pharmaceutical sector internationally competitive. According to the 2014 Health Workforce Development Assessment Report by the National Institutes of Health, the distribution of pharmacists employed in the medical care system is as follows: 35.57% of them were employed in hospital pharmacies, 38.02% in community pharmacies, and 26.41% in clinical pharmacies. Moreover, according to time-series statistics released by pharmaceutical institutions under the Ministry of Health and Welfare: there were more hospital pharmacists than community pharmacists before 2009; however, pharmacists'

willingness to practice in hospitals was declining after 2010 (see Figure 1), indicating a significant shortage of hospital pharmacists in recent years. Although the hospital pharmacy management system needs to be reformed, Taiwan's pharmacy education does not provide a comprehensive set of criteria for managing a hospital pharmacy in areas such as pharmaceutical staff promotion and high-quality workplace.

Figure 1. Comparison of the number of hospital pharmacists and other pharmacists in Taiwan



Source: Ministry of Health and Welfare

The separation of medicine and pharmacy in Taiwan's medical and pharmaceutical industry refers to the division of labor between pharmacists and physicians. While physicians are responsible for diagnosis, medical treatment, and prescription without drug dispensary, pharmacists are responsible only for drug dispensary (Rawls, 1982). With this division of labor between the two professions, physicians and pharmacists can independently perform their functions of reviewing, supervising, and balancing based on their respective professional knowledge, thereby achieving joint medical care of patients, protecting of the rights of medication safety for patients, and improving medical efficiency. This spirit of separation between medicine and pharmacy has led to an increasing number of community pharmacies in recent years (Cooksey *et al.*, 2002).

A hospital pharmacy's pharmaceutical services comprise three major areas: outpatient pharmacy, inpatient pharmacy, and pharmacy management. The drug dispensary of outpatient and inpatient pharmacies includes the examination of general prescriptions, drug dispensing, and chemotherapy and intravenous admixture of special prescriptions. Pharmacists' practices should comply with relevant regulations of the Good Dispensary Practice (GDP) (Jurado *et al.*, 2016). Drug consulting services involve both demotic and professional personnel whose work scope covers drug information editing, education and training, formulary editing, and public health education. Clinical pharmacy services include clinical visits, blood concentration monitoring, drug use assessment, and

adverse drug reactions monitoring. A clinical pharmacy also conducts integrated assessments on the medication of long-term-care patients and other related procedures. Note that pharmacy management also involves inventory management, validity management, quality management, and personnel management (Naranjo-Gil, 2009).

Although hospital pharmacy is a medical unit from a management standpoint, the pharmacy department performs its specialized functions that directly affect the hospital's overall financial status, clinical drug safety, and pharmaceutical service quality. The pharmacy department of a hospital therefore needs to adopt innovative strategies and management models to maintain the hospital's competitiveness, (Goes, Park, 1997). An array of past studies has examined various hospital management models (e.g., Swensen *et al.*, 2016), but only a few of them have focused on hospital pharmacy management. In view of the shortage of hospital pharmacists, many hospitals have begun to focus on developing lean medical management, adopting management models such as learning organization and benchmarking, and strengthening the organizational management strategy from the top to the bottom (Rambaud, 2006). That is to say, it is important to implement an effective management model aiming to retain pharmacy talents (Gatwood *et al.*, 2018).

2.2 The Development of Balanced Scorecard

The Balanced Scorecard (BSC) approach is a strategic performance management tool jointly developed by Kaplan and Norton in 1992. The philosophy behind this approach is that: *"If you can't measure it, you can't manage it."* The primary function of BSC is to let an organization recognize its mission and strategy (De Silva, 2013), to connect quantitative indicators with corporate activities and translate the organization's slogans into actual actions. BSC has the qualities of guidance, diagnosis, change, and integration for improving organizational performance. Whether BSC can perform its intended functions in an organization depends on leadership support and the organization's cultural changes. Kaplan expressed the core spirit of BSC as follows: *"The scorecard is similar to a dashboard in a car. As you drive, you can glance at the dashboard to obtain real-time information."* BSC contents reflect performance indicators from past operational outcomes. Such indicators cover customer satisfaction, internal business processes, organizational innovation, and improvement actions.

BSC is a strategic management tool translating corporate strategies into actions (Grigoroudis *et al.*, 2012), which embodies the "strategies" of an organization and creates competitive advantages. The BSC approach is a comprehensive framework that is conducive to transforming strategies into actions. The entire framework is similar to an architectural blueprint of a building comprising four management perspectives/dimensions as illustrated in Figure 2:

1. Financial perspective for measuring and differentiating revenue growth, cost reduction, and asset utilization. Kaplan & Norton (1999) argued that a single traditional financial performance measure is not a good performance measurement model, while a model of multiple performance measures is sufficient to reflect past operational performance, show the implementation outcomes of corporate strategies, and summarize the economic outcomes of the implemented strategies.

2. Customer perspective for measuring and differentiating image and reputation, customer relationship, and service attributes. Kaplan & Norton (1996) put forth core measurement criteria focusing on target customers with the use of market share, customer retention rate, customer acquisition rate, customer satisfaction, and customer profitability to measure the effectiveness of strategic implementations and performance adjustments.

3. Internal business process perspective for measuring and differentiating innovation cycle, operation cycle, and service cycle. Kaplan and Norton (1996) argued that an organization must first develop a strategy that meets the expectations of shareholders and target customers in the process of developing BSC. Based on such a strategy, measures and goals of internal business processes are constructed. That is to say, the manager must first define a complete value chain for internal business processes before constructing BSC.

4. Learning and growth perspective for measuring and differentiating employee capabilities, information systems, and motivation. Kaplan and Norton (1996) suggested that the learning and growth perspective is the driver of the other three perspectives by providing them with supporting infrastructures.

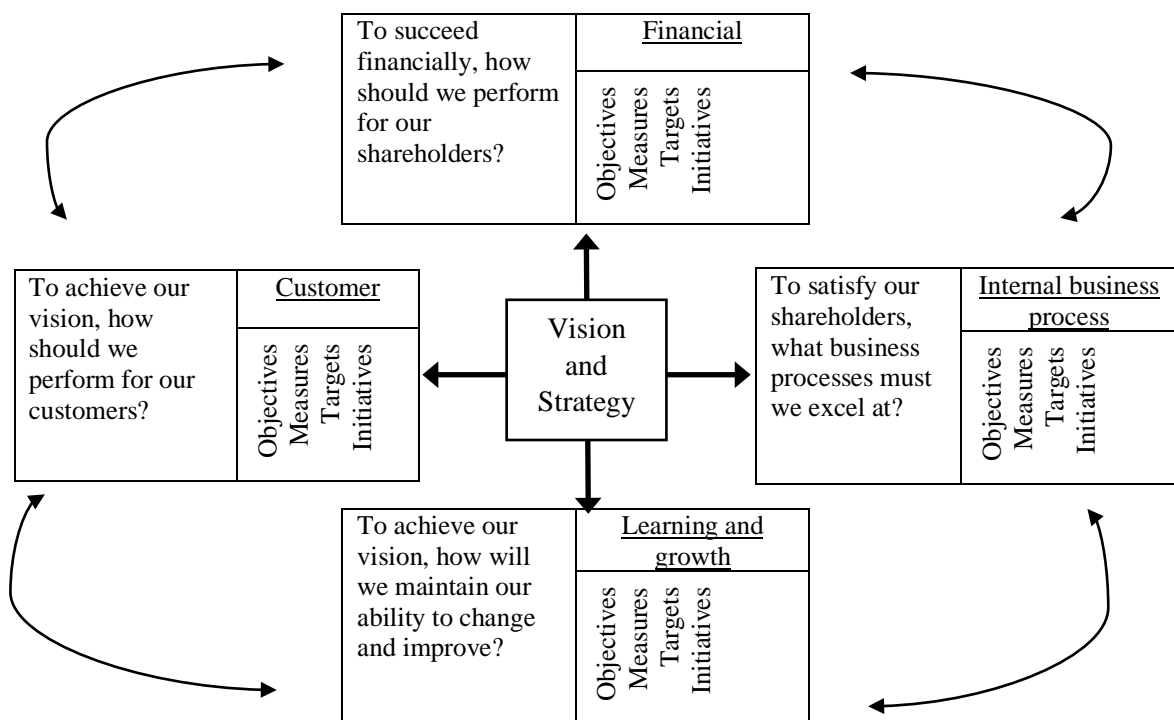


Figure 2. Balanced Scorecard (Kaplan and Norton, 1996)

2.3 The Key to the Success of Hospital Pharmacy under BSC

Total quality management has been prevalent among hospitals that have introduced various methods of quality management and improvement. Among those methods, BSC is the only approach that can integrate various methods and effectively link them with the development of hospital management strategies. Financial capability is the key to the success of BSC because a hospital needs to have such capability to evaluate employees' performance, to provide employees with training and education to ensure BSC-related learning, develop a comprehensive performance appraisal management system, and connect BSC with a pharmacist incentive reward mechanism for retaining talents (Bergeron, 2017). The skills and methods of implementing BSC in hospital pharmacies include the timing of implementation, inter-disciplinary linkage, effective communication, leaders' determination, and enhanced learning. Hospital pharmacy managers should

understand the hospital's vision, mission, and values, all of which can be regarded as the connotation of the hospital's culture. They can then develop a linkage of those vision, mission, and values with hospital pharmacy. Vision provides a direction for hospital development that cannot be achieved overnight. Therefore, it is necessary to refine, interpret, and analyze the vision through the process of refinement and analysis of vision, such as discussing with hospital pharmacist teams and developing short-term, medium-term, and long-term objectives.

3. RESEARCH FRAMEWORK AND METHODOLOGY

3.1 Research Framework

It is important in a decision-making process to obtain a management tool with objective, unbiased, and multi-perspective measures for assisting the overall decision making. With respect to hospital performance indicators, an application of Analytical Hierarchy Process (AHP) was proposed in *Constructing Performance Evaluation Criteria with AHP for Nurse Anesthetists*, where AHP is combined with factor analysis to identify three measurement perspectives and 19 performance indicators for evaluating the performance of nurse anesthetists. Another application of AHP was proposed in *Research on the Performance Indicators of Hospital Drug Management*, which develops performance indicators and their respective weights for drug management serving as the basis of hospital drug managers' management strategies.

With respect to the conceptual framework of this study, four perspectives/dimensions of BSC are considered as influential factors at the second level. As proposed by Kaplan & Norton (1996), 12 measures within the four BSC perspectives are used as performance indicators at the third level. This study completely specifies the performance indicators for hospital pharmacy management in an effort to develop a comprehensive measurement tool.

First, we collected expert opinions and reviewed relevant literature on the setting of performance indicators. Second, this study employed a hierarchical framework established by the four BSC perspectives with 12 performance indicators as the main analytical items. After that, we conducted an AHP questionnaire survey with hospital pharmacy supervisors so as to understand the views of the respondents and assign weight coefficients as a basis of comparison (Saaty and Vargas, 2012). Finally, the relative weights between the four perspectives and 12 performance indicators were assessed as an objective performance evaluation.

Figure 3 illustrates the conceptual framework of this study. Figure 4 is the hierarchical structure of indicators development and weights analysis. This study develops operational definitions for the four BSC perspectives and 12 performance indicators of the conceptual framework as shown in Tables 2 and 3.

3.2 Research Objects

The research objects of this study are public hospitals in Taiwan. This study first explored relevant theories and literatures and then applied the Analytic Hierarchy Process (AHP) to the management of hospital pharmacy and implementation of the four BSC perspectives/dimensions, i.e., the financial perspective, the customer perspective, the internal business process perspective, and the learning and growth perspective.

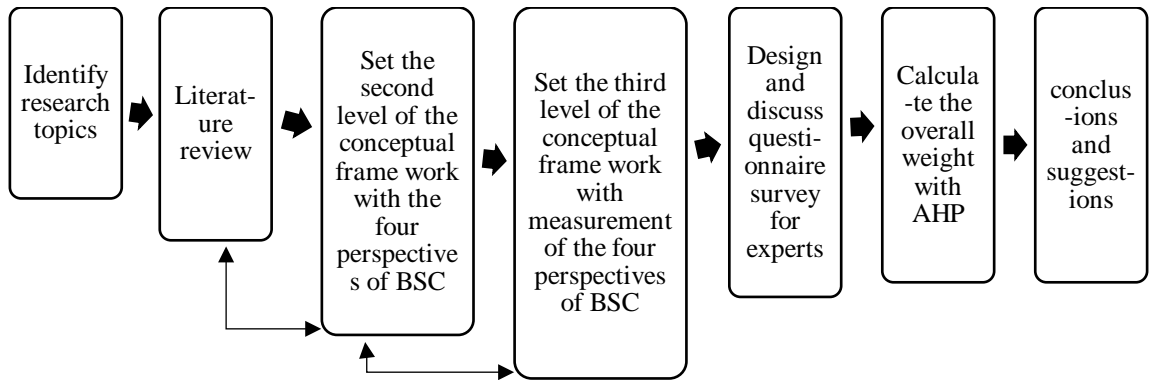


Figure 3. Research framework

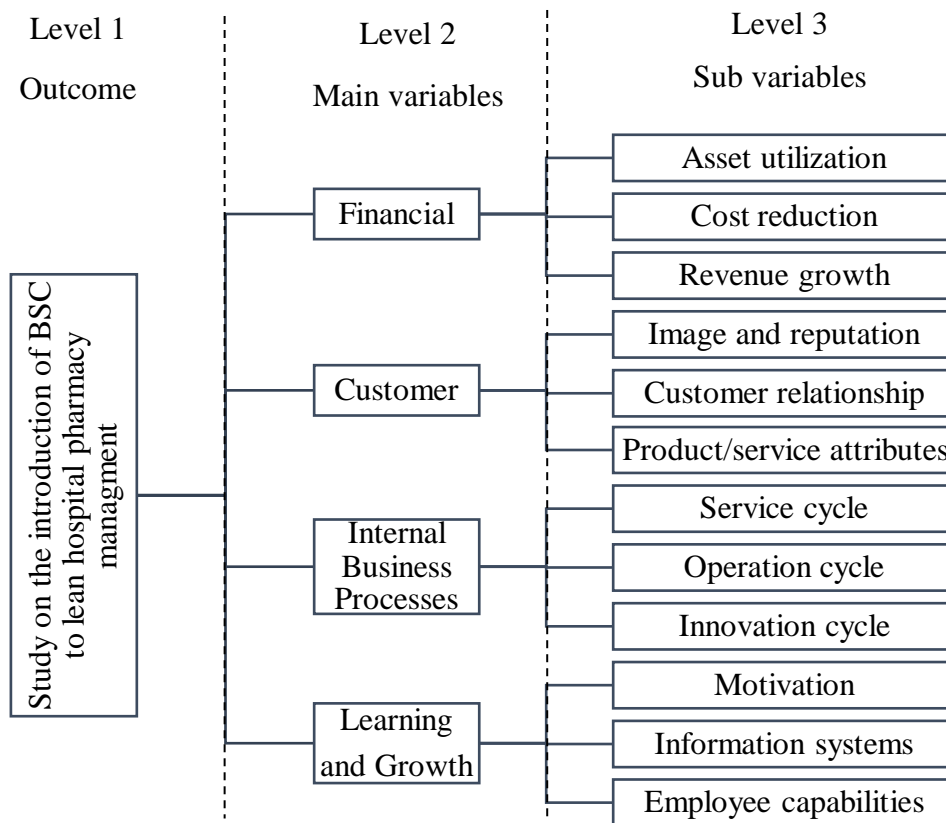


Figure 4. Hierarchical structure of indicators development and weights analysis

Table 2. Operational definitions of the key success factors

Main Variable	Operational Definition	Reference
Financial	A single traditional financial measure is not a good performance measurement model. A model of multiple performance measures is sufficient to reflect past operational performance, show the implementation and execution outcomes of corporate strategies, and summarize the economic outcomes of the implemented strategies.	Kaplan & Norton (1999) Nabelsi, V., & Gagnon, S. (2017)
Customer	Focusing on target customers. Using market share, customer retention rate, customer acquisition rate, customer satisfaction, and customer profitability to measure the effectiveness of strategy implementation. Performance adjustments according to the existing circumstances of target customers and the operating conditions of the company.	Kaplan & Norton (1996) Cowart, K., & Olson, K. (2019)
Processes	Developing strategies to meet the expectations of shareholders and target customers in the process of BSC development. Based on such a strategies, measures and goals of the internal business processes are constructed. The manager must define a complete value chain for the internal business processes before constructing BSC.	Kaplan & Norton (1996) Nabelsi, V., & Gagnon, S. (2017)
Learning and Growth	The learning and growth perspective is the driver of the other three perspectives by providing them with supporting infrastructures.	Kaplan & Norton (1996) Mehralian, G., Nazari, J. A., Nooriparto, G., & Rasekh, H. R. (2017)

Table 3. Operational definitions of the evaluation indicators

Main Variable	Sub Variable	Operational Definition	Reference
Financial	Revenue growth	Revenue growth of a business unit during the growth/harvest period.	Kaplan & Norton (1999) Nabelsi, V., & Gagnon, S. (2017)
	Cost reduction	Cost reduction by automation and standardization.	Kaplan & Norton (1996) Nabelsi, V., & Gagnon, S. (2017)
	Asset utilization	Return on capital utilization and return on investment.	Stewart (1994) Nabelsi, V., & Gagnon, S. (2017)
Customer	Product/Service attributes	Service attributes including function, price and quality.	Kaplan & Norton (1996); Heskett (1990) Cowart, K., & Olson, K. (2019)
	Customer relationship	Service delivery time and customer experience.	Kaplan & Norton (1996) Cowart, K., & Olson, K. (2019)
	Image and reputation	Intangible factors attracting customers.	Kaplan & Norton (1996) Cowart, K., & Olson, K. (2019)
Internal Business Processes	Innovation cycle	The design of a business unit's value chain for identifying customer needs and providing products/services to satisfy those needs.	Kaplan & Norton (1996) Nabelsi, V., & Gagnon, S. (2017)
	Operation cycle	The second-level process of the internal value chain that involves creating and delivering products and services to customers.	Kaplan & Norton (1996); Cooper, R. G. (1996) Nabelsi, V., & Gagnon, S. (2017)
	Post-sale service cycle	The third-level process of the internal value chain that involves after-delivery customer services.	Kaplan & Norton (1996) Nabelsi, V., & Gagnon, S. (2017)
Learning and Growth	Employee capabilities	Changes in employees' roles and capabilities.	Kaplan & Norton (1996) Mehralian, G., Nazari, J. A., Nooriparto, G., & Rasekh, H. R. (2017)
	Information systems	Utilization of information in a competitive environment.	Kaplan & Norton (1996) Mehralian, G., Nazari, J. A., Nooriparto, G., & Rasekh, H. R. (2017)

Motivation	Employees are motivated with empowerment and compatibility.	Kaplan & Norton (1996) Mehralian, G., Nazari, J. A., Nooriparto, G., & Rakesh, H. R. (2017)
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3.3 Research Method - Analytic Hierarchy Process

When designing the questionnaire, this study developed performance measures through literature review and interviews with experts. AHP is a decision-making methodology developed by Saaty (1971), which is primarily employed to deal with decision-making problems with multiple evaluation criteria under uncertain situations. AHP breaks down a complex situation into attributes following a certain hierarchical order and assigns a subjective judgment value to indicate the relative importance of each attribute. The results are then integrated to determine the priorities of the attributes (Saaty, 1980). An AHP analysis involves several steps as follows:

Step 1: Define the research problem.

Research problem and purpose are defined in this step. It is also essential to include and probably expand essential elements that may influence the problem and purpose.

Step 2: Develop a hierarchical framework.

Brainstorming and other techniques (such as questionnaires and relevant data analysis) can be utilized to set the criteria and sub-criteria that affect the research problem. A preliminary structure is presented to the decision maker for him/her to decide whether to add or to remove certain criteria. A binary relationship is determined between every two elements among all the elements affecting the problem. The hierarchical levels should be independent of each other. There should be no more than seven evaluation elements at each level (Saaty, 1980).

Step 3: Construct a pairwise comparison matrix at each level.

After setting the goals, the second-level objectives (i.e., criteria), and the third-level evaluation criteria (i.e., sub-criteria), pairwise comparisons can be made for each pair of criteria to construct a pairwise comparison matrix. Saaty (1980) suggests that the evaluation scales of the two-to-two pairs of objectives and criteria should be expressed on a 1 to 9 scale. The fundamental AHP evaluation scale comprises five items, which are: not important (1); weakly important (3); essentially important (5); strongly important (7); and absolutely important (9). There are also four additional items (i.e., 2, 4, 6, and 8) capturing the intermediate values between these five basic scale items.

Step 4: Calculate the eigenvector, eigenvalue, and relative weights of the elements at each level.

This step involves constructing a pairwise comparison matrix and determining the maximum eigenvalue and the criteria weight vector for the matrix. A comparison matrix is developed through assigning a weight to each pair of the criteria. A pairwise matrix is constructed according to different levels. Subsequently, the dominant vector can be identified by numerically analyzing the eigenvalues.

Step 5: Calculate objective and criteria weights.

The maximum eigenvector obtained from the comparison matrix represents the weights of the respective criteria. Saaty (1980) proposed four approximates for the maximum

eigenvalue, among which more accurate results can be obtained by normalizing the mean of the row vectors.

Step 6: Check for consistency.

The values of the elements in the pairwise comparison matrix are judged by the decision makers according to their subjective opinions. Because of the multitudinous hierarchical levels and elements in the decision makers' judgements, it is difficult for them to reach consistency based on pairwise comparison. Thus, consistency check is required for the values based on the consistency index (C.I.) and consistency ratio (C.R.). Expert Choice 2000 is used to conduct AHP that turns a complex problem into hierarchical comparisons and rankings.

4. RESEARCH RESULTS

4.1 Sample Description

This study distributed an online questionnaire to 36 hospitals including municipal hospitals (i.e., regional hospitals, local community hospitals, and psychiatric hospitals) and hospitals affiliated to the Ministry of Health and Welfare. 32 completed questionnaires were returned from pharmacists who had worked in a pharmacy department for at least 20 years (see Table 4).

4.2 Research Results

Step 1: Screening the questionnaires.

An inconsistency check was performed on each questionnaire collected. Expert Choice, a decision-making support software, was used as the analytical tool for this study using the Inconsistency Ratio (I.R.) as the screening criterion. Those questionnaires with I.R. < 0.1 are considered meeting the consistency criterion, while those with I.R. > 0.1 are excluded from the sample. As a result, there are 32 usable questionnaires.

Step 2: Verifying the consistency at each level and the overall level.

The overall I.R. of the questionnaires is $0.01 < 0.1$ which is desirable. The I.R. at each level of the questionnaire is less than 0.1, indicating a large degree of consistency at each level and consistent views of the respondents on the questionnaire elements. The I.R. values of the BSC perspectives/dimensions at each level are reported in Table 5.

Step 3: Calculating the respective weights of the BSC perspectives and performance indicators at each level (see Table 6 for the results).

The learning and growth perspective is the second most important perspective with a weight of 0.271. To achieve long-term learning, growth, and progress, the learning of hospital pharmacy is conducted in three aspects: pharmacists, information systems, and organizational procedures. As such, the learning and growth perspective narrows the gap between the performance indicators of the financial, customer, and internal business process BSC perspectives.

Table 4. List of respondents

Survey Respondents	Number of respondents	Employers	Hospital types
Pharmacy Department (Division) Manager	26	Hospitals affiliated to the Ministry of Health and Welfare and municipal hospitals	Regional hospital; Psychiatric hospital
Pharmacy Department (Division) Manager	6	Hospitals affiliated to public medical colleges	Medical center; regional hospital; quasi-medical center

Table 5. Inconsistency Ratio of BSC perspectives

BSC Perspective	I.R. Value	Qualified
Financial perspective	0.01	Yes
Customer perspective	0.03	Yes
Internal process perspective	0.01	Yes
Learning perspective	0.01	Yes

Table 6. Weights of BSC perspectives and performance indicators

Perspective	Perspective Weight (w)	Performance indicator	Indicator Weight (w)	Overall Hierarchical Weight (w)	Overall Hierarchical Ranking (w)
Learning perspective	0.271	Employee capabilities	0.258	0.068	8
		Information systems	0.356	0.095	5
		Motivation	0.386	0.103	3
Internal process perspective	0.321	Innovation cycle	0.294	0.101	4
		Operation cycle	0.355	0.122	1
		Post-sale service cycle	0.351	0.120	2
Customer perspective	0.218	Product/service attributes	0.310	0.062	9
		Customer relationship	0.411	0.083	6
		Image and reputation	0.279	0.056	11
Financial perspective	0.191	Revenue growth	0.308	0.059	10
		Cost reduction	0.380	0.072	7
		Asset utilization	0.312	0.059	10

Therefore, pharmacy managers are suggested to provide technical training to pharmacists, strengthen drug information technology, and utilize automated drug delivery systems (Maitreemit, Pongcharoensuk, Kapol, and Armstrong, 2008). Without continuous learning and growth, hospital pharmacists will be stagnated at work, causing an increase in dispensary errors, a decrease in corporate solidarity, and a rising turnover rate (Nwambie, 2018).

The customer perspective is the third most important perspective with a weight of 0.218. Hospital pharmacy managers need to identify customer attributes and perform market segmentation. The customer perspective contains customer satisfaction and retention. Most people consider public hospitals as reliable and trusted local medical care providers in Taiwan. Therefore, understanding customer attributes and needs, making the right decisions, and employing the right methods are the first step in reducing the pressure on hospital pharmacists.

The least important BSC perspective is the financial perspective with a weight of 0.191. That is to say, pharmacy managers believe that the financial position of public hospital pharmacies reflects their past performance. The competition between medical institutions is increasingly fierce, which means that increasing income sources is becoming more difficult.

Table 7. Proportion of weight of the four perspectives of BSC introduced into hospital pharmacy management

Perspective name	Perspective weight (w)	Ranking
Community	0.271	2
Processes	0.321	1
Customer	0.218	3
Financial	0.191	4

4.3.2 Analysis of Indicators

After analyzing the four perspectives, this study further analyzes the weights and rankings of the 12 performance indicators. The I.R. values of the four BSC perspectives are 0.01, 0.03, 0.01, and 0.01, respectively, which fulfil the consistency criterion of I.R. < 0.1 as proposed by Saaty (1980).

4.3.2.1 Learning and Growth Perspective

There are three indicators in the learning and growth perspective. Among them, the most important indicator is motivation with a weight of 0.386, which is followed by information systems with a weight of 0.356. The least important one is employee capacities with a weight of 0.258. From a hospital pharmacy manager's point of view, the learning and growth perspective provides supporting infrastructures driving the other three BSC perspectives to achieve organizational goals in the process of developing learning and growth strategies for pharmacists. This suggests that hospital pharmacists need to perform well in those areas aiming to achieve breakthrough performance. The

findings also suggest that, although hospital pharmacists possess technical expertise and accessible information systems, they are unable to contribute to the success of hospital pharmacies if a positive attitude and/or active learning is absent. Therefore, from the learning and growth perspective, apart from strengthening hospital pharmacists' skills and capabilities, hospital pharmacy managers also need to improve the applications of information technologies (Carise, McLellan, Gifford, & Kleber, 1999). Moreover, enhancing motivation is an important strategy to promote team morale and retain hospital pharmacists.

4.3.2.2 Internal Business Process Perspective

There are three indicators in the internal business process perspective. The most important indicator is operation cycle with a weight of 0.355, which is followed by service cycle with a weight of 0.351. The least important one is innovation cycle with a weight of 0.294. The first step of developing a balanced scorecard is usually developing the performance indicators for the financial and customer perspectives, which is followed developing the performance indicators for the internal business process perspective. These procedures of implementation allow hospital pharmacy managers to set priorities and focus on the interrelated processes pertaining to the cohesion of customers and the solidarity of the pharmacist team. It can also facilitate the operation cycle of cross-functional medical services of hospitals. Due to the aging population in Taiwan, the population of the silver-haired group with multiple chronic diseases is increasing. In fact, with respect to the integrated service cycle initiated by pharmacists, the medication safety for patients has become an urgent issue. Providing pharmaceutical services is a professional responsibility of pharmacists in directly taking care of patients' medication. Through such pharmaceutical care, pharmacists' expertise can go into local communities, improve the effectiveness of medical treatment and life quality, examine the drug use conditions and efficacy, and develop a good relationship of mutual trust with physicians. Presently, this kind of professional responsibility is an important subject to hospital pharmacy managers. Through the internal value chain (innovation, operation, and service), hospital pharmacists can gain customers' recognition and understanding of their roles and value orientations.

4.3.2.3 Customer Perspective

There are three indicators in the customer perspective. The most important indicator is customer relationship with a weight of 0.411, which is followed by product/service attributes with a weight of 0.310. The least important one is image and reputation with a weight of 0.279. From the customer perspective of BSC, a hospital pharmacy needs to identify the attributes of its services and market segmentation to establish a closer relationship with its core customers. Measures for such core customer relationship include customer satisfaction, loyalty, and retention rate. Apart from drug and process flow management, there have been not a comprehensive framework, model, and strategy for the management of public hospital pharmacies. If a hospital pharmacy manager does not understand customer needs, the hospital will lose market share to its competitors. Therefore, managers of hospital pharmacies need to take a two-pronged approach to targeting the needs of in-house pharmacists and external customers.

4.3.2.4 Financial Perspective

There are three indicators in the financial perspective. The most important one is cost reduction with a weight of 0.380, which is followed by asset utilization with a weight of 0.312. The least important one is revenue growth with a weight of 0.308. The financial goal intersects the objectives and measures of all the BSC perspectives. Therefore, each measure identified by BSC should be linked to the others to improve the organization's financial performance. In the medical care industry, business performance can be represented by financial performance, non-financial performance, production efficiency, cost effectiveness, productivity, service quality, customer satisfaction, internal process efficiency, learning and growth, etc. Managers of public hospital pharmacies typically consider cost reduction as the most important aspect of financial performance (Curtiss, 1983). Moreover, Taiwan's health insurance system has driven hospital pharmacy managers to pay more attention to financial management analysis.

Finally, this study ranks the 12 performance indicators in terms of their weights. As can be seen from the hierarchical weights, the operation cycle indicator and the service cycle indicator of the internal business process perspective are ranked the highest, which are followed by the motivation indicator of the learning and growth perspective and the innovation cycle indicator of the internal business process perspective, and then followed by the information systems indicator of the learning and growth perspective. The top four most important performance indicators belong to the internal business process perspective, except for motivation indicator that belongs to the learning and growth perspective. This suggests that hospital pharmacy managers are most concerned about the design of the overall operation cycle and the service value process. It also shows the determination of public hospital pharmacies in innovation and reform, which requires a proactive pharmacist team to work together in achieving organizational goals. As for the customer relationship indicator of the customer perspective, it is a sacred mission of the public hospitals to take care of the local people (Susan, *et al.*, 2017). Among the three lowest-ranked indicators, the image and reputation indicator belong to the customer perspective, which is followed by the revenue growth indicator and the asset utilization indicator of the financial perspective. This implies that managers of public hospital pharmacies clearly understand that public hospitals are not profit-oriented medical institutions.

This study also takes into account the inter-correlations among the sub-variables. For instance, at the third level, the sub-variables of "motivation" and "cost reduction" may reflect the fact that public hospitals are motivated to minimize wastage because they have limited public funding and need to reduce costs by public tendering for drugs and medical equipment. As for the sub-factors of "innovation cycle" and "employee capabilities", in order to improve employee capabilities and revenue growth, managers not only need to reform service procedures but also need to train employees' capabilities. For the sub-factors of "operation cycle" and "image and reputation", since the reformation of operation procedures for hospital pharmacy management is closely related to information systems, upgrading the information systems to boost customer relationship and stimulate revenue growth is necessary for analyzing the internal processes. Since the inter-correlations among the sub-variables pertain to factors and sub-factors analysis, future studies could explore such inter-correlations within factors and sub-factors by the fuzzy AHP method.

5. CONCLUSION AND RECOMMENDATIONS

This study's objective is to explore the key influential factors of hospital pharmacy management in Taiwan. Using the BSC approach, this study formulates an appropriate management framework and derives performance indicators for hospital pharmacies from four perspectives/dimensions, namely, the financial perspective, the customer perspective, the internal business process perspective, and the learning and growth perspective, with the purpose of retaining hospital pharmacists. Furthermore, this study adopts the AHP method to calculate the relative weight of each performance indicator. Using the identified key performance indicators, this study constructs a practical model for hospital pharmacy management that is conducive to improving hospital pharmacy management and enhancing the cohesiveness of a pharmacist team.

Pharmacy management is crucial to the quality of pharmaceutical services and medication safety which are the focuses of hospital performance evaluation (Joint Commission of Taiwan, 2011). This study develops four perspectives and twelve performance indicators using data collected from a survey instrument and consolidates the findings into specific recommendations. Findings from this study improve the performance management practices of domestic hospital pharmacies and serve as useful references for hospital pharmacy management.

Using the BSC approach, the four BSC perspectives and their respective weights are as follows: the "internal business process perspective" ($w=0.321$), the "learning and growth perspective" ($w=0.271$), the "customer perspective" ($w=0.218$), and the "financial perspective" ($w=0.191$). The overall I.R. value is 0.01 indicating overall consistency. The individual I.R. values for the four BSC perspectives are 0.01 for the "financial perspective", 0.03 for the "customer perspective", 0.01 for the "internal business process perspective", and 0.01 for the "learning and growth perspective". These results meet the consistency requirement of AHP.

The results also suggest that pharmacy managers consider the "internal business process perspective" as the most important perspective for hospital pharmacy management, which is followed by the "learning and growth perspective" and the "financial perspective". The "financial perspective" is relatively less important because public hospitals are non-profit oriented. As medical care is a kind of customer service, managers of public hospital pharmacies recognize that, in addition to improving the quality of pharmaceutical services, they need to pay more attention to customer service efficiency and the internal solidarity of the pharmacist team. This implies that the managers need to pay attention not only to the overall operation cycle but also to the service cycle relative to the innovation cycle. This explains why the internal business process perspective is the most important one among the four BSC perspectives.

In terms of the overall ranking of the performance indicators, the top five most important indicators are: operation cycle ($w=0.122$), service cycle ($w=0.120$), motivation ($w=0.103$), innovation cycle ($w=0.101$), and information systems ($w=0.095$). Three of these most important indicators belong to the internal business process perspective while two of them belong to the learning and growth perspective. This reconfirms that the internal business process perspective is the most important perspective for public hospital pharmacy management.

With respect to the importance of the key performance indicators in each perspective, "cost reduction" is the most important indicator in the "financial perspective";

“customer relationship” is the most important indicator in the “customer perspective”; “operation cycle” is the most important indicator in the “internal business process perspective”; and “motivation” is the most important indicator in the “learning and growth perspective”. This study finds that the weight of the “operating cycle” indicator within the dimension of “internal business process” is rather significant, which is probably due to the complex operations of public hospital pharmacies. Public hospital pharmacies need to integrate their operation lines to reduce the waiting time, improve service efficiency, and increase customer satisfaction. The weight of the “motivation” indicator is higher than those of other indicators within the “learning and growth” perspective. A plausible explanation is that public servants tend to have conservative mindsets because they are usually trained to follow instructions. The weight of the “customer relations” indicator within the “customer” perspective is also significant, which implies the importance of service marketing in the operations of public hospitals. Therefore, public hospitals should be aware of the importance of service marketing and adopt service quality standards that are sufficient to meet customer needs and expectations. The high weight of the “cost reduction” indicator in the “financial” perspective is mainly caused by the rising costs of drugs, which implies that public hospitals need to adjust drug prices to maintain revenue growth.

Taken together, findings from this study serve as a useful reference for managing the performance of hospital pharmacies. As this study’s sample covers only hospitals affiliated to the Ministry of Health and Welfare and municipal hospitals in Taiwan, future research may expand the sample to include a broader range of hospitals and modify the research design to include other quantifiable performance indicators tailored for different types of hospitals.

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