Budget Allocation for Information Logistics in Taiwanese University

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This research serves the primary purpose to support the reform of administration budgets for Taiwanese universities to optimize their document processing system. The main research method applied is quantitative analysis to explore the relationships between document quantity and each administration spending. The research observes that Taiwanese universities in general rely more on electronic systems to manage documents. Therefore, as proven by correlation test and regression model, personnel spending and miscellaneous spending are the only two categories which can help predict document flows. However, only miscellaneous spending is positively related to document quantity, so this category should be allocated with more funding. Personnel spending, on the contrary, should be less. For the long-term budgeting strategy, Taiwanese universities should begin with discovering problems from the existing system, design an allocation plan, execute the plan, and finally evaluate the outcomes. This project is on the first to explore the new academic research field which relates to logistics, budgeting, and university administration.

Keywords: budget allocation, information logistics, university administration

Introduction

In the US, most administrative information in colleges and universities are processed by organized and structured logistics systems, which allow the staffs to prepare resources more conveniently. In Taiwan, some universities have already implemented new procedures to manage information, but most of the others could not improve the systems, so they often require longer time periods to open classes, training programs, and other services. From my internship experience as a document analyst at one of the universities in Taiwan, most information remains manually processed as documents. The logistics of documents is not mechanized, so the process usually consumes longer time periods. Because of its inefficient system that leads to delay transporting information, the decision-making process usually requires weeks to complete. Eventually, the delivery of "outputs", including education, research, and training services, is severely disturbed. Academic and vocational training qualities are core competitive advantages for Taiwanese universities, so in order to strengthen their compatibility, efficient administration is the cornerstone to accomplish this objective. Similar to factories who

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implement new production techniques to enhance the quality and to increase the quantity of their products, the university can adjust or reform its logistics system to process more documents, which can create more opportunities for teachers, students, and staffs to expand academic and research advantages. In short, though indirectly, optimizing the information processing systems for administrative units will manufacture more "outputs" that generate more revenues, which are significant for future developments.

Although efficiency in information management is essential to grow the university, in fact, currently it does not have sufficient budget to invest on it. First of all, information technology (IT) equipment is expensive, so it is impossible for frequent replacements. Second, average personnel expenses, which occupy approximately 80% of the overall annual budget, are restricted by the Taiwanese government to adjust. Third and the last, other spending such as facility and academic research also require abundant funds to be developed. As a result of these three obstacles, the remaining allocable budgets are always limited. Therefore, the main research question for this project is to discover which elements associated with the document process should be invested for optimizing administrative efficiency. Next, the research will determine the ideal but realistic proportions for each expenditure budget to achieve this objective.

Contribution and Benefits of the Study

Currently, there are limited studies about information logistics, so most of the managers at LTU are lacking knowledge of improving the document processing system. The primary purpose of this project is to answer the research question: How should the four administrative spending categories - personnel, miscellaneous, IT, and pension - be allocated in order to optimize the information logistics system? With the statistical analyses, the findings will provide clear and strong evidence to guide the current and future administrative or financial managers. In addition, this research will be helpful for scholars who are interested in educational leadership, organizational behavior, information management, budgeting and financial controls, and public administration not only in Taiwan, but also in other countries.

Literature Review

In this project, the research concentrations will be on logistics, budgeting, and university administration. Although the main issue is about a university's information logistics, budgeting is always the first step to plan the solutions. Therefore, it is necessary to discuss about how to adequately allocate available funds to achieve the goal of this project. In this section, theories from these three concentrations and their relationships among one another are going to be discussed.

Before designing the budget format, learning the dynamics of logistics can help determine the elements which should be considered during the planning process. The ultimate goal of logistics is to coordinate activities that maximize production with the shortest time schedule and minimum operating costs (Herrmann, 2010, p. 243). In order to achieve this goal, Chang and Wu (2011, p. 329) indicated two requirements: planning and execution. In operation management, a correct beginning (planning) will lead to the first half of success, and another half must be achieved by implementation and execution (Chang & Wu, 2011, p. 329). After all, to manufacture more outputs, the factory should always search methods to reserve time and capital resources.

After the planning process, the next step is to execute the decisions. To design the most appropriate budget that optimizes the logistic, it is essential to understand how a logistic system operates. During the execution stage, a Japanese organizational theorist Kaoru Ishikawa (1985) introduced the idea of "4M", which

refers to material, machine, method, and man. Ishikawa (1985) believed that these essential factors were significantly influential in both quality and efficiency of a logistic process. In modern factories, process technology, observed by Chang and Wu (2011, p. 282), becomes the main character to manage 4M during each stage of the production line: manufacturing, testing, transportation, and package. From their perspective, technological innovation and application are the required elements to foster a logistic system which is able to efficiently manufacture outputs with solid qualities (Chang & Wu, 2011). "Radical manufacturing technologies", introduced by Sinha and Noble (2008), refers to the manufacturing tools and technologies that have potentials to reorganize a production line through disrupting and reducing the weaknesses of existing competitive advantages.

General logistic theories and methods can support enhancing Taiwanese universities' administrative document logistic, since for a university, documents are inputs which are processed into a service as an output. University's administrative units, indeed, require constructing an efficient document processing system. To achieve this goal, information logistics plays the key role (Ibezim & Obi, 2013). As mentioned by several scholars, technology application is essential to determine the success in the production line. The university's administrative units, indeed, require investments to enhance efficiency of document logistic, and IT system will play the key role for this project. In order to adequately allocate available funding to achieve this objective, the next section of literature review will discuss about budgeting strategies for the information logistics.

Monetary resource is the most essential input for executing every decision, because every item applied must be exchanged by this resource. The purpose of budgeting is to allocate available funds to the prioritized spending items. Budget helps determine practical development directions for the managements, since it considers the limitations from each alternative decision. In addition, budgeting can foster effective investments to generate more resources which can strengthen the organization's compatibility in the industry. This process is the cornerstone for prospective developments, and its primary objective is to apply the minimum spending to maximize profits (Y. J. Lee, Sun, S. F. Lee, & Lin, 2007, p. 124).

In financial forecasting, there are several perspectives which need to be considered. Applying the implications from the Governmental Accounting Standards Board (GASB) of the US, decision makers should include long-term development plans, stakeholder analyses, organizational culture and structure reports, prospective financial forecasts, and the history of financial performances into the budgeting negotiations (Chan, 2001). In addition, due to frequent occurrence of unexpected events that influence the environment, Chan (2001) suggested that the budget method and format should be adjusted annually in order to adapt with the environment.

Investing on the logistics system to enhance efficient production or administrative process is the most urgent discussion for an organization, either for profit or not. For non-profits, including schools, since they do not manufacture physical inventories, information logistics is the foundation that supports the operations. Information logistics system is more essential for non-profit sectors, since their services, whose major inputs are processed by information logistics systems, are directly benefiting the citizens. Therefore, from Schafer's (2013, p. 28) perspective, the logistics system is not an end in itself; instead, it possesses a value in improving the lives of the citizens, or other stakeholders who use the services. The Government Accountability Office (GAO, 2004) of the US would agree with Schafer, but GAO also warns that information logistics project can also become risky, expensive, and involves unproductive mistakes. Therefore, similar to Wilson and Kattelus (2003) as mentioned before, the GAO (2004) recommended conducting detailed analyses when deciding the investment strategies. Otherwise, the organization will magnificently lose profits and prospective compatibility, and the citizens will be dissatisfied due to inconvenient services.

From Wilson and Kattelus' (2003) perspective, this "Five Stages of Maturity" can lead to successful IT development through effective investments. Applying the ideal budgeting procedure, the five stages are defined as follows: Stage 1 is setting the strategy direction, Stage 2 is allocating available resources, Stage 3 is executing and monitoring the operation, and Stages 4 and 5 are evaluating the performance (Wilson & Kattelus, 2003, p. 322; GAO, 2004, p. 11). Figure 1 below is combining the concepts of Planning, Budget, and Performance Management (PBPM) Process and Five Stages of Maturity.
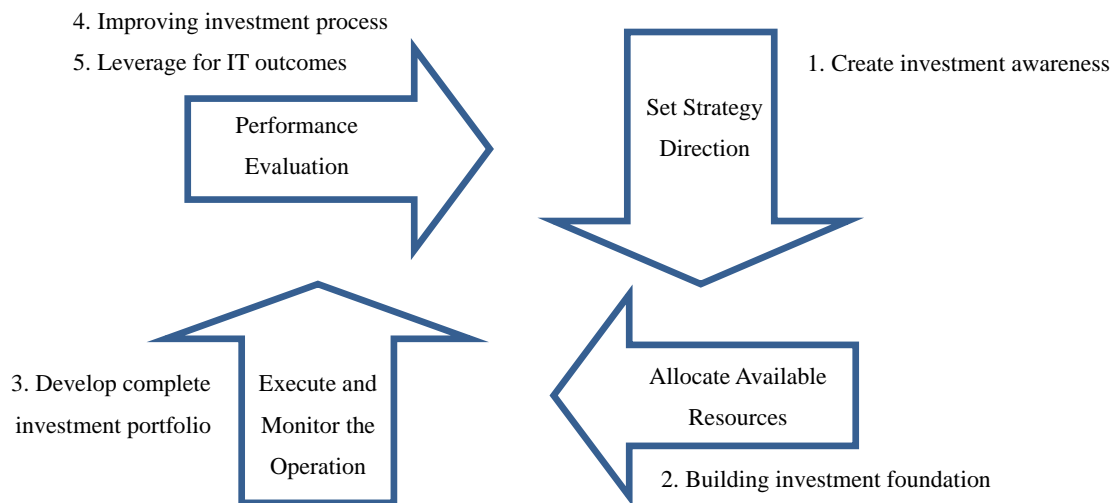

Figure 1. PBPM and Five Stages of Maturity. Source: Wilson and Kattelus (2003) and GAO (2004).

Applying the general definition of budgeting, a profitable logistics system should not only focus on shortening production schedules, but also attempt managing the costs. The main responsibility of budgeting in logistics is to reserve resources for more productions (Chang & Wu, 2011). The consumptions on materials, utilities, supplies, and labors must be considered in logistics budgeting, because redundant expenditures will lose the profitability of the production line. In order to establish a competitive logistics system, financial efficiency is the key element which should be achieved by effective budgeting.

Research Methodology

The major data sources are electronic document records and annual financial reports from 10 private vocational universities with similar student populations. This research will not involve any interactions with humans since all files are secondary data. Both document records and annual financial reports are available online. From the financial reports, only administrative spending is studied because document process is an administrative activity. Applying Ishikawa's (1985) "4M" in logistics, all categories in administrative spending except pension can be considered as the following: personnel as man, miscellaneous as material, and IT as machine. These are available on every university's accounting office websites. Documents in university administration, defined by Degkwitz and Schirmbacher (2008), are the tools to transport information that fosters academic and relative services. From their perspective, document quantity determines the sufficiency of a university's educational service. To collect data for documents, the website (http://edoc.moe.gov.tw/docrpt/index.php), established by the Ministry of Education (MoE) for recording all processed electronic documents since 2008, is the major source. The data are translated into English for the research in this chapter.

There are five variables to be used for analyses: each college's annual document quantity and administration spending in personnel, miscellaneous, IT, and pension. Personnel spending refers to salary paid to staffs, and it is separated from pension. Miscellaneous includes electricity, gas, water, and supplies used by administrative units. Maintenance, depreciation, and amortization are expenses related to IT, so these three are combined as "IT spending". In accounting term, depreciation and amortization indicate the values of facilities, equipment, and software. Facilities and equipment in administrative units are mostly IT systems which are applied for document processing. Pension is a spending for funding staff retirement benefits. The spending is presented in percentages for the primary purpose of controlling factors which may affect document quantities such as student enrollments, staff populations, land sizes, revenues, and total assets possessed by universities. In addition, percentages can provide clearer directions for prospective budget allocations, regardless of funding and other influential limitations. For clear demonstrations, numbers are rounded into two decimals in the charts which are presented to compare 10 sample universities.

The analyses include correlation analyses and regression. The first research methodology is correlation test for relationships between document quantity and each administrative spending. All five variables are abbreviated in SPSS: "DocCount" as annual document quantity, "PersonSpend" as personnel budget, "MisSpend" as miscellaneous, "ITSpend" as maintenance, depreciation and amortization expenses, and "PenBenSpend" as pension. If the relationship is strong and positive, then it means that the certain expenditure is related to the document process, which implies a demand for additional investments on this category. On the contrary, if the correlation is negative or insignificant, then there is no demand for investment, which implies that the spending should be reserved for the ones which can optimize the document logistics. In order to solidify the evidence for decisions, hypothesis testing is necessary. The research hypotheses are described as follows:

H_0: There is no significant relationship between document quantity and (personnel, miscellaneous, IT, or pension) spending proportion.

H_a: More documents processed require higher/lower proportion of (personnel, miscellaneous, IT, or pension) spending.

SPSS is applied to process the data and then calculate the correlation and significance tests. Correlation, represented as "Pearson correlation", determines which administrative spending has strong or weak and positive or negative relationships with the document process. If Pearson correlation coefficient is high, then the relationship is stronger, either directly or inversely (Szafran, 2012, p. 218). On the contrary, if correlation is low, then the relationship is weak, meaning that the certain spending and document quantity are not related. The correlations are demonstrated by scatterplots graphed by SPSS. The significance tests are applied to testify the correlations. The confidence level is 90%, so if the significance level shown on the analysis is higher than 0.1, then the null hypothesis is true, concluding that the certain spending does not relate to document process (Szafran, 2012, p. 240). On the contrary, if the significance is 0.1 or lower, then the null hypothesis is rejected and should keep alternative hypothesis (Szafran, 2012, p. 240). All variables are numeric, which belongs to interval/ratio variables. The sample size of the correlation test is 54, which are the total of available annual document records for 10 universities cross six years from academic year 2008-09 to 2013-14 (some data were not available).

In addition to the correlation analyses, a multiple regression model is established to determine whether the spending is a strong predictor for document quantity. In this test, independent variable is the spending categories which are proven as significantly related to document quantity in the correlation analyses, and document quantity is the dependent variable. Similar to the correlation analyses, if the significance level is greater than or equal to 0.1, then the spending is not related to the other spending and document quantity. On the contrary, if the significance level is lower than 0.1, then the spending is significantly related to the other spending and document quantity. The adjusted R square is applied to determine what percentage of data in the sample can be explained from the model (Szafran, 2012, p. 245). In addition, standardized coefficient determines the strength of prediction for the independent variables, which are administrative spending in this research (Szafran, 2012, p. 246).

Research Results

Document Quantity vs. Personnel Spending

Figure 2 shows a negative relationship between document quantity and personnel spending proportion. The Pearson correlation is -0.229, which represents a negative and moderate relationship.
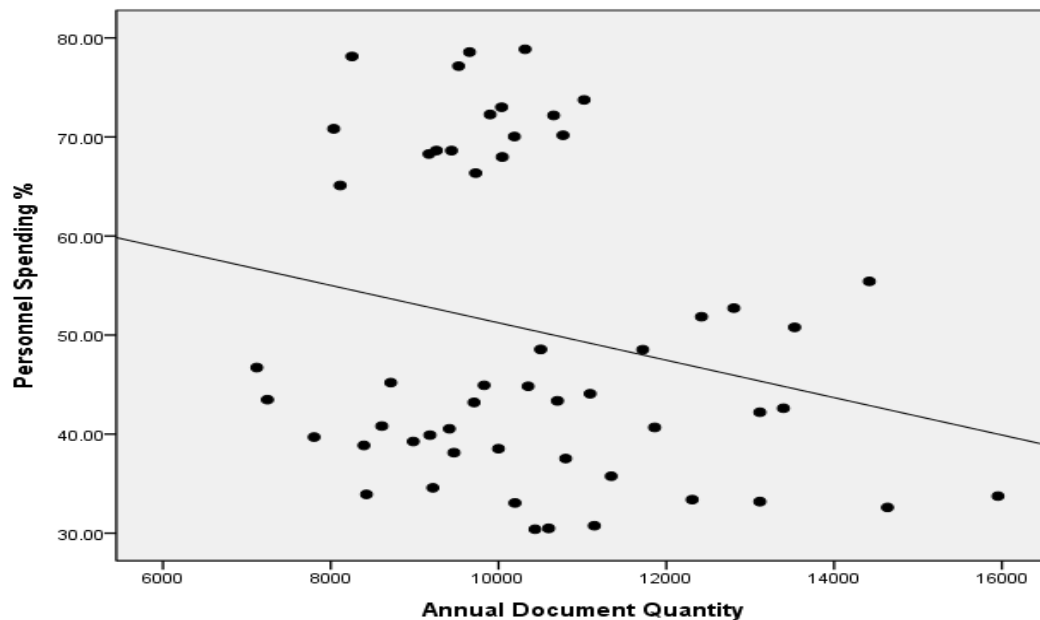

Figure 2. Scatterplot (document quantity vs. percentage of personnel spending).

Table 1

Correlation (Document Quantity vs. Percentage of Personnel Spending)

		DocCount	PersonSpend (%)
DocCount	Pearson correlation	1	-0.227
	Sig. (2-tailed)		0.099
	N	54	54
PersonSpend (%)	Pearson correlation	-0.227	1
	Sig. (2-tailed)	0.099	
	N	54	54

However, the significance level shown in Table 1 is 0.099, which is lower than the hypothesized level of 0.1. Therefore, the null hypothesis is rejected. The alternative hypothesis should be taken, and it means that higher document flow is associated with lower proportion of personnel spending.

Document Quantity vs. Miscellaneous Spending

Figure 3 below shows that miscellaneous spending proportion will be expanded with higher volumes of documents.
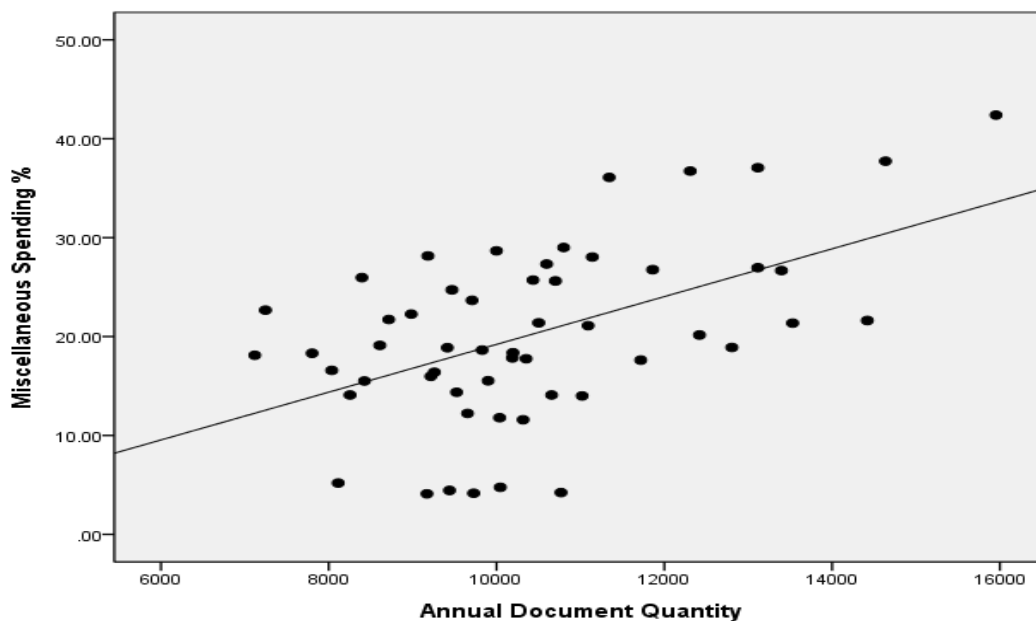

Figure 3. Scatterplot (document quantity vs. percentage of miscellaneous spending).

Table 2

Correlation (Document Quantity vs. Percentage of Miscellaneous Spending)

		DocCount	MisSpend (%)
DocCount	Pearson correlation	1	0.514[**]
	Sig. (2-tailed)		0.000
	N	54	54
MisSpend (%)	Pearson correlation	0.514[**]	1
	Sig. (2-tailed)	0.000	
	N	54	54

Note. [**]: $p < 0.05$.

The Pearson correlation coefficient is 0.514 as shown in Table 2, which represents a positive and strong relationship between document quantity and miscellaneous spending proportion. The significance level calculated from the regression test is 0.00, which is lower than the hypothesized level of 0.1. It suggests that more documents to be processed in the future will require higher proportion of miscellaneous spending.

Document Quantity vs. IT Spending

Figure 4 does not show a clear relationship, so it shows that IT spending cannot be affected by document quantity.
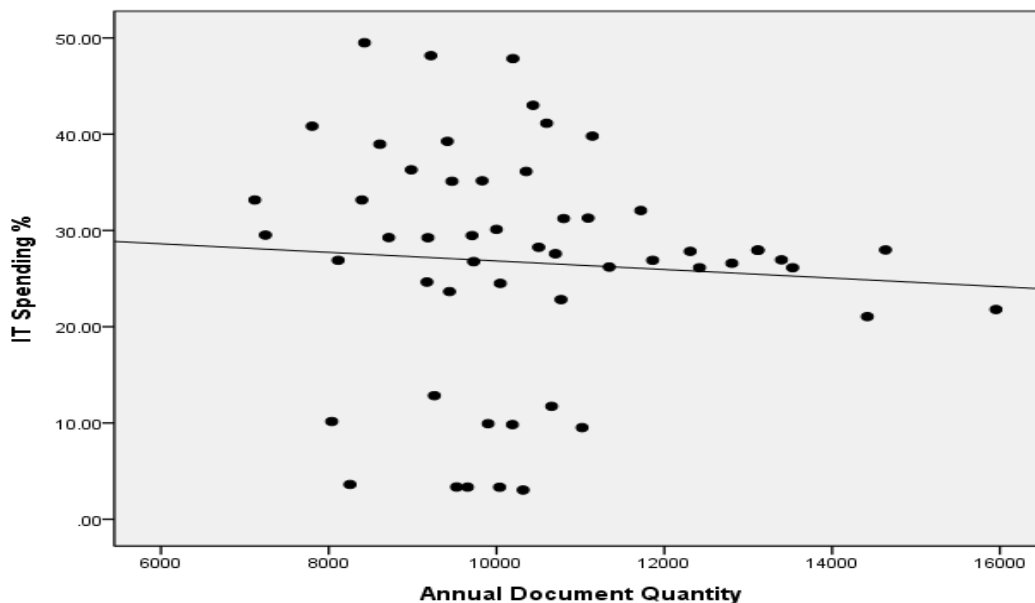
Figure 4. Scatterplot (document quantity vs. percentage of IT spending).

Table 3

Correlation (Document Quantity vs. Percentage of IT Spending)

		DocCount	ITSpend (%)
DocCount	Pearson correlation	1	-0.071
	Sig. (2-tailed)		0.611
	N	54	54
ITSpend (%)	Pearson correlation	-0.071	1
	Sig. (2-tailed)	0.611	
	N	54	54

The Pearson correlation coefficient shown in Table 3 is -0.071, which represents a negative but very weak relationship. The significance level calculated from the correlation test is 0.611, which is noticeably higher than the hypothesized level of 0.1. Therefore, the null hypothesis is not rejected which suggests that document quantity and IT spending proportion do not associate with each other.

Document Quantity vs. Pension Spending

Figure 5 shows a more ambiguous relationship, since most data are varied from 2% to 4% of pension spending, which is a short range.

Table 4

Correlation (Document Quantity vs. Percentage of Pension Spending)

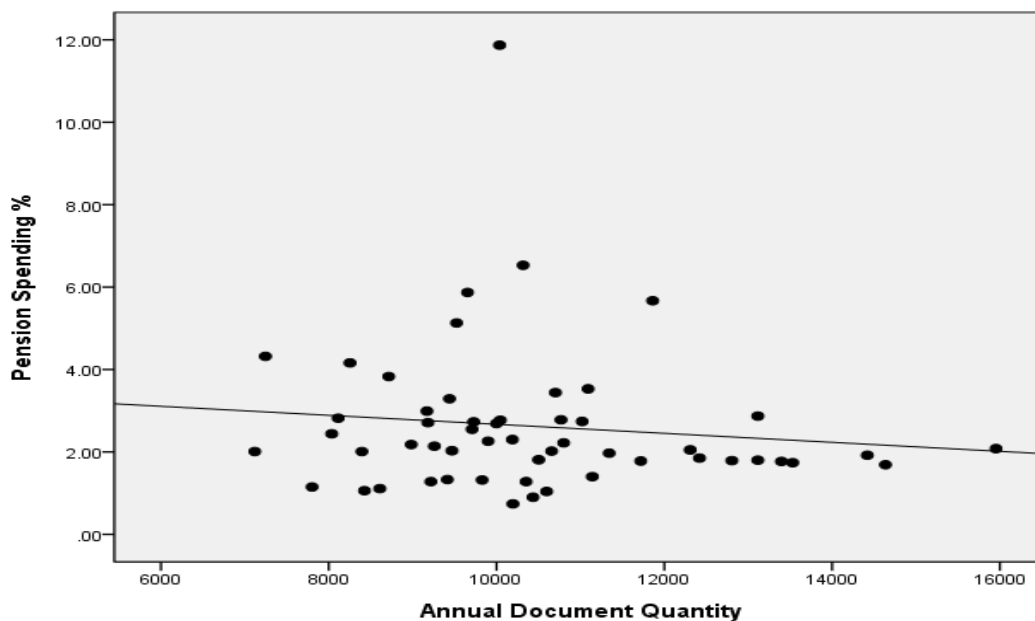|		DocCount	PenBenSpend (%)
DocCount	Pearson correlation	1	-0.115
	Sig. (2-tailed)		0.406
	N	54	54
PenBenSpend (%)	Pearson correlation	-0.115	1
	Sig. (2-tailed)	0.406	
	N	54	54

Figure 5. Scatterplot (Document quantity vs. percentage of pension spending).

The Pearson correlation coefficient shown in Table 4 is -0.115 which represents a negative but very weak relationship. The significance level calculated from the correlation test is 0.406, which is significantly higher than the hypothesized level of 0.1. Therefore, the research can keep the null hypothesis which means that document quantity and pension spending proportion do not associate with each other.

According to the above correlation analyses, personnel spending and miscellaneous spending are the only two which are significantly related to document quantity. In order to test the relationships between these two spending and document quantity, a multiple regression analysis is presented to establish the model based on these three variables.

Conclusion

As Degkwitz and Schirmbacher (2008) mentioned, university is a non-profit institution which provides education services, so information logistics is emphasized by the administrators for improving campus developments. However, budgeting for optimizing the document processing system in the administrative units is rigorous since the facilities are expensive and the majority of funds are usually spent to academic departments. In order to apply scarce resources to optimize the logistics efficiency, strategically allocation is critical to sustain the continuous system development. As shown by the empirical analysis in this research, with heavier reliance on electronic document processing system, the only necessary operation expenditure will be miscellaneous items such as utilities, which is relatively affordable comparing to other costs. Personnel, due to the document processing's dependence on the electronic system, becomes less significant. So it should be the primary category to be reserved.

We recommend the following budgeting strategies for Taiwanese universities' information logistics:

(1) Review the growth trends of document flow to discover problems and improvement opportunities for administrative document processing system;

(2) Design a budget allocation plan by determining which administrative spending is related to document volumes. For the short-term, miscellaneous spending should be emphasized, and personnel should be reduced;

(3) Finalize the budget proposal and implement it. Also, it should be ensured that the funds be allocated according to the proposal;

(4) Evaluate whether the expenditures can effectively support the system to manage more documents. Ideally, the spending plan should help save time in document processing, for developing a more efficient education, training, research, and service delivery system.

Saving time is also a potential benefit that can build a university's prospective success. For a successfully operated organization in modern era of technology, efficiency in production process becomes a more essential indicator. After all, efficiency refers to maximum production within minimum time. So more efficient a process is, more outputs can be completed and then generate more profits. For a school, reserving times enable faculties and teachers to teach more classes, to recruit more students, to discover more career opportunities, or to perform other activities that can support the school's short- or long-term developments. Besides prospective financial benefits, more efficient information logistic will enhance both faculty and student satisfactions to the school, because times are saved that allow users to perform other tasks. Similar to factories, excessive times reserved allow more outputs. In short, efficiency nowadays determines profits, which indicate the success of an organization. This is the reason why enhancing production efficiency becomes the primary element to strengthen organization's compatibility.

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