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ASSESSMENT-DRIVEN INTEGRATION OF INFORMATION TECHNOLOGY CURRICULUM IN A BUSINESS PROGRAM

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ABSTRACT

Assessment is the systematic collection and review of information about student learning in an educational program. The primary goal of assessment is improvement in student learning. A systemic approach to program assessment implemented in a business program led to integration across the management information systems courses in the curriculum. While "horizontal" integration of material from several subject areas has received much attention in the literature, in this study we focus on "vertical" integration of topics within the same area presented at a progressively higher level in a sequence of courses. A comparison of data collected over four semesters, shows statistically significant improvement in student learning in the topics that appear at several points in the curriculum through vertical integration of curriculum. The analysis of assessment data supports the effectiveness of vertical integration in improving student learning.

A SYSTEMS PERSPECTIVE ON EDUCATION AND ASSESSMENT: BACKGROUND

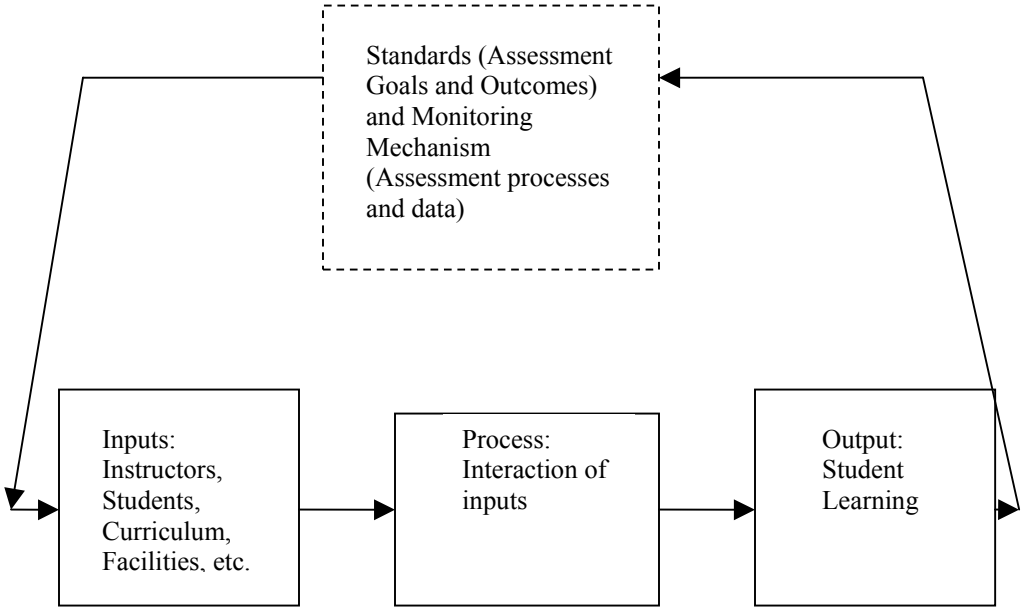
Assessment of student learning is a multi-stage process. It involves formulating the goals and objectives of the education process, collecting information on how the goals and objectives are achieved, and "closing the loop" in the sense of making changes to the education process based on the analysis of the data. According to Paloma and Banta (1999), "assessment is the systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student learning and development".

This study is grounded in the basic theory of systems. A system is defined as a group of elements working together to achieve a common goal. A system consists of inputs, process, and output. In order to control the system it is necessary for the system to have feedback,

leading to creation of a closed-loop system. The system is controlled by monitoring the various elements and making adjustments necessary in case of any deviations of the output from the expectations. Parts of the systems to be monitored, vary from system to system and are governed by the organizational requirements.

The education process can be viewed as a system. In the case of the education process, the system inputs include students' knowledge, instructors' expertise, curriculum, facilities, and so on. The education process incorporates the interaction between the various inputs to the system. The output involves student learning. A variety of data is generated by every part of the system. These data include on the input level - incoming student statistics, course syllabi, instructor qualification information, on the process level – intermediate grades, drop-out rates, etc., finally on the output level – final course grades, instructor evaluations, and the like.

Figure 1: Systems approach to education.



To effectively assess the performance of the education system, several steps are necessary. First, the goals of the system are to be clearly stated. Effective assessment requires specifying the goals of the education program, and the objectives of areas / courses. Once the goals are specified, appropriate data can be collected in order to assess whether the goals and objectives are achieved. The data collected are then processed, analyzed, and interpreted. These data are also stored for future retrieval. These data help resolve any discrepancies in achieving the goal of the education process.

It is critical to understand that the ultimate goal of assessment is not in the collection of these data, or in the creation of assessment methodologies and techniques but in improving student learning. The systems approach to education and assessment organizes the process through development of process goals and planning of assessment activities. However, improvement in student learning can only be achieved when analysis of the data collected in assessment activities leads to changes in the education process. In addition, if assessment results are not used for "closing the loop", it is difficult to justify to the faculty the time and effort expended in assessment (Seybert, 2002). Examples of effective use of assessment results in process improvement can be found in Banta and Associates (1993) and Banta et al. (1996).

The basic research question addressed in this study is how a proper integration of the courses at different levels of a business program helps improve student learning. Below we discuss the role of curriculum integration in improving student learning. In the case we present in the following sections, systematic assessment activities demonstrated that students can miss the linkages between topics addressed in various information systems courses in a business school. In order to make sure that the overall system goals of student learning are achieved, the objectives or outcomes of all the subsystems within the overall education systems need to be aligned and integrated. The challenges of such integration are discussed in the next section.

Horizontal and Vertical Integration in the Management Information Systems Curriculum

The issue of curriculum integration has received a significant amount of attention in the literature; however, the focus of most studies is in creating a multi-disciplinary curriculum, uniting the material from several areas. We will call this "horizontal" curriculum integration, as

opposed to "vertical" where topics in several courses within the same content area are integrated.

The idea of curriculum integration first became popular in elementary education, as teachers develop integrated units encompassing a variety of topics as discussed, for example, by Hinde (2005) and Ignatz (2005). The importance of integration in business curriculum in higher education has been emphasized in a number of recent research studies. Hamilton et al. (2000) describe the primary approaches for curricular integration. In the teaching of information systems, this trend is further demonstrated by Cannon et al. (2004) and Johnson et al. (2004) in the attempts to use a common case study linking problems from marketing, finance, accounting, and production in the management information systems (MIS) course. The MIS course then focuses on the role of technology in solving problems facing the various business functional areas. Markulis et al. (2005) presented a model for curriculum integration developed by the business school at the State University of New York at Geneseo. The model uses a comprehensive case based on a real-world insurance company. Their research outlines how the school plans to integrate the case into several upper-level business courses. Lorents et al. (2003) investigated the effect of implementing strategies designed to help students develop an integrated view of business functions. They documented the effect of horizontal integration on student performance by comparing grades in a set of courses taken individually with grades in the same courses taken as an integrated block. The results indicate that grades were more correlated when the courses were delivered as a block. In summary, according to Hamilton et al. (2000) the integration of business curricula is an important trend in management education that will continue well into the 21st century.

In this study, we describe integration efforts that concentrate on the alignment of topics between several courses in the MIS area. As mentioned above, this concept is addressed as "vertical" curriculum integration. In this approach, a topic is introduced in an early course in a sequence, and then enhanced and reinforced in the subsequent course(s) as opposed to horizontal integration where the focus is on integrating information systems concept across various functions such as marketing, finance, accounting etc. As an example of vertical integration, similar hardware and software topics in an introductory course of information systems and in an intermediate course in information systems are viewed from different perspectives. In the introductory course a simple

description of hardware and software elements of information systems is presented. In the first course, the focus is on developing skills to use the hardware and software in contrast to the intermediate course where students learn how to build and develop information systems to support business problems using the hardware and software skills students learned in the previous course. In other words, in the intermediate course these concepts are taken one step further by getting into the applied side of hardware and software elements. An in-depth application of hardware and software is presented from the perspective of solving business problems. Horizontal integration mainly focuses on functional integration – showing the role of IS across different functions such as marketing, finance, accounting etc. Using the vertical integration approach requires careful alignment between goals and structures of the different courses, and a significant level of cooperation between faculty members involved in teaching.

In the educational process "system", a set of courses developed within the curriculum represents the subsystem. Goals and objectives of these related courses must be aligned. That is, the students' learning from one course should be progressively integrated with what is to be learned from the next course. In the case of technical courses such as information systems, the concepts and hands-on skills from the first course in a sequence are especially crucial to succeed in the following course. The contents of the two courses have to be examined and logically divided between the courses. Because of the dynamic nature of the technology, the contents of the courses have to be regularly reviewed and redistributed between the courses. In addition to the changes in technology, there is also a change in the students' knowledge of the technology as the time progresses. For example, the technology concepts taught at college level at one time are now taught at the high school level.

Two elements critical in the development of technology-based courses are – teaching how to use the technology and how and when to apply the technology in a given business situation. Examination of a number of university curricula shows that, in general, two different sets of courses are typically developed – one focuses on how to use the technology, and the second focuses on how and when to apply the technology. The first set typically includes courses on various software languages, application software, and database software. The second set includes courses on the use of technology in various situations such as e-

commerce, database applications, decision support systems, expert systems, and management information systems (MIS). The second set of courses requires students to be computer literate about technology which they generally learn in the first set of courses. Thus, it is critical that there is proper integration between the two sets of courses so that when students decide to take second set of courses they understand the nature of technology applied in classroom examples.

Integrating Computer Literacy and MIS Courses

This section describes vertical integration of two information systems courses in a business school on a small campus of a public Midwestern university. The school offers a basic course on computer literacy. In this course, all the business and non-business major students learn to use popular office software such as spreadsheet, database, word processor, presentation, and basic web design. The school also offers a course on management information systems (MIS) for all business majors. At present, all business major students are required to take both the computer literacy and MIS courses. In the past, the MIS course was offered as an elective. This setup did not seem logical because the students who opted not to take the MIS course would not completely understand the business applications of the software they learn in the computer literacy course. Even though students get to develop projects in the computer literacy course, the "how to use" versus "when to use" aspect is the main focus of the course. Since MIS was not a required course, there was no emphasis placed on how computer literacy course can be integrated with the MIS course. The course contents were not well defined because the MIS course was an elective. As a result of the school's assessment efforts, the faculty identified this weakness in the curriculum. In order to correct this situation, the school made the MIS course required with the computer literacy course as a prerequisite. This necessitated the school faculty to make sure that computer literacy and MIS course are properly integrated and aligned. This task was accomplished by carefully analyzing the contents of both computer literacy and MIS courses and proper selection of the textbooks for both courses.

By taking the systems approach in defining and integrating the contents of computer literacy and MIS courses it was relatively simple for the faculty to arrange the sequence of topics to cover in both the courses. The goals and outcomes for both courses were carefully stated

and aligned. The task was further simplified by selecting the same textbook for the hands-on computer projects portion of the courses. Specifically, the database and spreadsheet projects textbooks were the same for both courses. The first half of the book was covered in the computer literacy course and the other half in the MIS course. The idea is to introduce basic computer skills in the first course and then enhance and reinforce the same skills in greater depth by using the second half of the book in the second course. This helps students gradually develop the understanding of the software use in solving the business problem. For example, in the first course the students learn how to design a basic database and a webpage. In the second course the same skills are further developed by discussing the application of the database and web technologies in e-business and in business problem solving. This gave students an opportunity to get gradually familiar with the use of software and also the textbook format. The concept books for these courses were different. Because of the focus on computer literacy in the first course, a textbook with basic hardware and software concepts was chosen. In the MIS course, the focus was on information literacy and the role of information systems in business decision-making, so a textbook that focused mainly on the applications of software in business situations was chosen to cover the concepts.

These changes are implemented and are in place for the past three semesters. In keeping with the systems view of the education process, the school collects assessment data to evaluate the impact of these curriculum changes on student learning. The results reported in the next section are promising and significant. The school plans to continue with the vertically integrated course designs.

ANALYSIS OF ASSESSMENT DATA

This section attempts to evaluate the effectiveness of the vertical integration of curriculum in improving student learning. Learning outcome assessment data are used in this evaluation. The faculty of the school establishes the learning outcomes of the education process, and collects data to assess the achievement of those outcomes. The data come from several sources – there are subsystems of entry and exit assessment that include the use of standardized national tests such as the ETS major field tests. In particular, the knowledge of graduates in certain subject

areas in business can be assessed by referring to their performance on these national tests. However, most of the data used to assess the effectiveness of specific courses comes from course-embedded assessment techniques. Course-embedded assessment (Ewell, 2003) is an effective means of examining student learning in specific areas, because it provides a great degree of freedom to the faculty in focusing the assessment activity. The faculty engaged in course-embedded assessment can incorporate the assessment techniques in existing assignments and grading routines, bringing down the monetary cost and resource requirements of the assessment system.

The data presented in this section comes from a course-embedded system of assessment that includes goals and outcomes for both general and business area specific education. Student performance in achieving those goals is measured in all required courses in the business curriculum. For the purposes of this study, it is important to focus on the outcomes specified for the MIS area.

Table 1: Mapping of assessment outcomes in information systems curriculum

	MIS Assessment Outcome	**Computer Literacy Course**	**MIS Course**
Outcome 1 (integrated)	Understand the concept of database, know the principles of database design and be able to apply them to business problems	Introduce	Enhance
Outcome 2 (integrated)	Understand the implications of telecommunications technology and e-business on organizations and business processes	Introduce	Enhance
Outcome 3 (non-integrated)	Understand the nature of information systems, their components and types		Introduce

	MIS Assessment Outcome	**Computer Literacy Course**	**MIS Course**
Outcome 4 (non-integrated)	Identify the impact of IS on organizational structure, business processes, and decision-making effectiveness		Introduce
Outcome 5 (non-integrated)	Understand the role of IS in delivering competitive advantage, and the strategic implications of IS		Introduce

Table 1 presents the five learning outcomes assessed in the MIS area. As the faculty implemented the vertical integration of topics between the computer concepts and the MIS courses discussed in the previous section, it became apparent that the first two outcomes have a strong technical component – the use of databases, and the use of telecommunications and web technology. It was decided to provide a uniform presentation of the technical projects in databases and web design between the two courses. The students use the same projects textbook in the two courses, and move from more straightforward projects in the concepts course to more analytical ones in the MIS course. The MIS course provides additional focus on the business use of the technology already introduced in the concepts course. Using the same set of project cases reinforces the links.

The other three assessment outcomes – topics on understanding the nature of MIS, its impact on organizational processes, and its strategic implications – do not have a direct technical component. As such, it was more difficult to incorporate them into the computer concepts course. Up to the current time, the presentation of these outcomes was not changed, and they effectively became the control group for this study.

The assessment of all five outcomes is based on incorporating questions that focus on a particular outcome into the tests presented in the course, and keeping track of student performance not just on the exam as a whole, but in every particular outcome area. More specifically, in the spring and fall semesters of 2005 the final exam in the MIS course included a section with twenty-five questions that were linked to the five

assessment outcomes, five questions per outcome. These questions were designed to measure student achievement of the five learning outcomes at the completion of the MIS course.

The assessment statistics calculated from these answers include the mean percentages of correct answers per outcome. In keeping with assessment guidelines, these percentages are not directly linked, to the final grades of the students. They only measure their understanding of the particular learning outcome areas.

Table 2 presents the results of the course-embedded assessment of the student learning in these MIS related outcomes. As mentioned above, the key assessment data collected is the mean percentage of correct answers on questions related to the five MIS learning outcomes. Table 2 presents the means of correct answers for the Fall 2003, Fall 2004, Spring 2005, and Fall 2005 semesters. The MIS course was not offered by the same faculty in Spring 2004, and the data for that semester are not available.

Table 2:Mean percentage of correct answers to questions related to MIS assessment outcomes 1-5.

	Fall 2003 (n=26)	**Fall 2004 (n=25)**	**Spring 2005 (n=21)**	**Fall 2005 (n=19)**
	Before Integration		After Integration	
Outcome 1 (integrated)	**71.5%**	**74.7%**	**82.9%**	**77.9%**
Outcome 2 (integrated)	**72.3%**	**75.0%**	**81.9%**	**83.2%**
Outcome 3 (non-integrated)	62.8%	56.0%	55.2%	61.1%
Outcome 4 (non-integrated)	79.5%	76.0%	76.2%	69.5%

	Fall 2003 (n=26)	**Fall 2004 (n=25)**	**Spring 2005 (n=21)**	**Fall 2005 (n=19)**
Outcome 5 (non-integrated)	71.4%	70.4%	77.1%	76.8%

Faculty worked on developing the vertically integrated curriculum in the 2003-2004 school year. The first cohort of students completed the computer concepts courses with the integrated topics in Fall 2004. These students went on to the MIS course in Spring 2005. Data in Table 2 present the results on student learning in the MIS course. Starting from Spring 2005, the majority of students in the MIS course had the opportunity to complete the integrated set of two courses starting with the computer concepts course and continuing with the MIS course. Thus, the data from Spring 2005 and Fall 2005 demonstrate the learning of students that took advantage of the vertically integrated curriculum for the first two learning outcomes.

Table 2 demonstrates that an improvement in student learning (as measured by the mean percentage of correct answers to test questions) was achieved for outcomes 1 and 2. Outcomes 3 and 4 did not demonstrate improvement in spring and fall of 2005. Outcome 5 shows higher percentages of correct answers in 2005.

To focus on the change in student learning after the integration of curriculum was completed, Table 3 groups the data for the Fall 2003 and Fall 2004 semesters as pre-integration, and Spring 2005 and Fall 2005 as post-integration. The table reports statistically significant improvement in learning outcomes 1 and 2 – the integrated outcomes – following the completion of curriculum integration. The results are reported based on 91 observations of students completing the MIS course over four semesters.

Table 3: Change in mean percentage of correct answers after integration of topics in curriculum.

	Before Integration (n=51)	**After Integration (n=40)**
Outcome 1 (integrated)	71.3%	80.5%
t-statistic for Outcome 1	1.804*	
Outcome 2 (integrated)	73.6%	82.5%
t-statistic for Outcome 2	2.089*	
Outcome 3 (non-integrated)	59.5%	58.0%
t-statistic for Outcome 3	0.345	
Outcome 4 (non-integrated)	77.8%	73.0%
t-statistic for Outcome 4	1.186	
Outcome 5 (non-integrated)	70.9%	77.0%
t-statistic for Outcome 5	1.349	

* - significant at the 5% level

Results are reported for two sample t-test assuming unequal variances. Data before the integration of topics was achieved includes the Fall 2003 and Fall 2004 semesters, for a total of 51 observations. Data after the integration of curriculum includes Spring 2005 and Fall 2005 semesters for a total of 40 observations.

The table includes two columns reporting data before and after integration of curriculum. A comparison of the data reported in Table 3 yields important results. Both outcomes where presentation was vertically integrated, that is, the material was first introduced in the concepts course and later enhanced in the MIS course, show improvement in the percentage of correct answers to the test questions. Specifically, for outcome 1 the change is from 71.3% in the two semesters before the integration to 80.5% in the two semesters after the integration. For outcome 2, the percentage increases from 73.6% to 82.5%. Running a *t*-test on the data shows that there is improvement in

the data, statistically significant at the 5% level. Examining the data for outcomes 3, 4, and 5 shows no statistically significant changes in the percentage of correct responses for any of the outcomes.

The fact that percentage of correct responses is significantly increased for the integrated areas of the information systems curriculum is very encouraging. The next steps for the school include further monitoring of the assessment data to ensure that the higher level of the student learning is sustained, as well as an effort to integrate the presentation of other topics in the MIS area. In particular, outcome 3 seems to lag behind. It remains to be seen whether the successful integration of technical skills and concepts encompassed by outcomes 1 and 2 can be extended to the more general management concepts assessed as outcomes 3 through 5.

CONCLUSION

This study details how vertical integration of information systems topics changed the curriculum in a business school. The process of curriculum change was initiated by examining assessment data that demonstrated the need for improvement in student understanding of information systems topics. The faculty responsible for the MIS area moved to integrate the presentation of material in the sequence of MIS courses. The presentation of topics that require the use of technical skills, such as the use of databases, was integrated between the computer concepts course and the MIS course. A set of common textbooks was adopted, and the classroom presentation of the material was unified.

An analysis of assessment data collected in the two semesters before the integration and the two semesters after the integration helps evaluate the effectiveness of the vertical integration of MIS curriculum. The course-embedded assessment data are used to measure student learning as captured by the percentage of correct answers on test questions linked to a particular learning process outcome. The MIS topics which are now present in two points in the curriculum - introduced in the computer concepts course and then enhanced in the MIS course – exhibit statistically significant improvement in student learning. The topics where presentation was not integrated did not demonstrate similar improvement.

The next move for the faculty is to evaluate whether the new level of student learning in MIS is sustained in future semesters. This is a challenge since the material presented in the MIS course sequence is adjusted by the constant technological progress and the development of new generations of software. The faculty also desires to expand the successful vertical integration of topics between courses in the MIS sequence, introducing some of the management-oriented content in the computer concepts course. The effectiveness of such expansion needs to be closely monitored.

In conclusion, this study demonstrates how a significant improvement in student learning can be achieved from vertical integration of curriculum topics between courses in a sequence. This integration represented a real change to the school's curriculum driven by assessment activities. Assessment data further helped evaluate the effectiveness of the changes. The results reinforce the idea that assessment should not be limited to gathering of data, but should serve as a guideline for action. Assessment itself does not bring about the achievement of the goals of the education system, but its data can inform the faculty to start real changes that bring about program improvement.

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COMPONENTS OF TWO-ASSET PORTFOLIO VARIANCE: A METHOD TO REPRESENT THEM GRAPHICALLY

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ABSTRACT

This pedagogical paper increases the intuitive understanding of the standard algebraic expression for the variance, $V_P = w_A^2 s_A^2 + w_B^2 s_B^2 + 2w_A w_B s_A s_B r_{AB}$, of a two-asset portfolio by displaying the relative magnitudes of each component of the expression graphically. Students can visualize the effects of changing correlation, asset standard deviations, and weights (including negative weights) upon the variance components, and total portfolio variance. The approach specifies variance and its components graphically as linear magnitudes, and adds (or subtracts) component line segments to obtain total variance. In addition, students can see how the composition of the minimum variance portfolio is affected by the correlation and relative standard deviations of the two component assets.

INTRODUCTION

One of the fundamental concepts in finance is diversification, which explains how investors can reduce portfolio variance by distributing their financial assets across many securities rather than holding all their wealth in a single security. Several introductory investments texts such as Corrado and Jordan (2005), and some corporate finance texts such as Ross, Westerfield, and Jaffe (2005), introduce Markowitz's (1959) familiar expression for two asset portfolio variance (TAPV), for assets A and B, as

$$V_P = s_P^2 = w_A^2 s_A^2 + w_B^2 s_B^2 + 2 w_A w_B s_A s_B r_{AB}. \quad (1)$$

where w_A and w_B indicate asset weight in the portfolio, s_A and s_B indicate standard deviation of asset return, and r_{AB} is the correlation between returns on the two assets. Expression (1) shows precisely the mechanics of how diversification works for two asset portfolios. More advanced investments texts, such as Bodie, Kane, and Marcus (2002), include also the more comprehensive expression for N assets,

$$V_P = s_P^2 = \sum_{i=1}^{N} w_i^2 s_i^2 + 2\sum_{i=1}^{N-1}\sum_{j=i+1}^{N} w_i w_j s_i s_j r_{ij}. \qquad (1a)$$

Most texts emphasize that the correlations between the assets are crucial for determining portfolio variance, but place less emphasis upon the contribution of the individual assets' standard deviations for determining portfolio variance. This may be due in part to the fact that, as the number of assets becomes large, the number of correlation terms in (1A) increases as the square of N, while the number of variance terms increases only with N. In a two-asset portfolio, standard deviations do play a significant role in determining total variance through both the variance terms in (1) and also because s_A and s_B appear in the correlation term.

However, many other introductory texts apparently find even expression (1) too challenging for their intended readers to understand, and attempt to convey the mechanics of diversification solely through numerical examples or graphs. The purpose of this paper is to provide a graphical interpretation of expression (1) in order to encourage a slightly more rigorous discussion of the mechanics of diversification at the introductory level. This approach can readily be implemented in a computer spreadsheet.

The plan of the paper is as follows. The next section gives a brief discussion of previous graphical representations of TAPV. The following section presents the algebraic adaptations to expression (1) that serve as foundation for the graphical analysis. Then, several graphical examples of the approach are presented and explained in the next section, with an emphasis upon how they can improve students' intuition about diversification. The final section provides a brief discussion and some conclusions.

PREVIOUS GRAPHICAL APPROACHES FOR ILLUSTRATING VARIANCES

Over half a century ago, as described in Markowitz (1990), Harry Markowitz conceived the idea of representing total portfolio variance as a function of the variances of, and the correlations between, its constituent assets. He introduced these concepts in Markowitz (1952), and presented them comprehensively in Markowitz (1959). He provided several different graphical representations of analytical frameworks, but his representations of portfolio variance always

reflected total variance. Although several parts of his discussion of efficient sets focused on how efficiency varied with changed in weights of assets in the portfolio, the focus of his analysis on efficient sets was different, and he did not need to decompose variance into its separate components.

Sharpe (1970) also used a graphical approach to show how changing asset weights affects the portfolio expected return and variance, but also did not find it necessary to develop a graphical decomposition of variance into its components.

In a recent paper, Arnold and Buchanan (2004) introduce a figure that, for different combinations of portfolio weights, represents the components of TAPV in a square. Within the square, two smaller squares represent the proportion of total variance contributed by each asset's variance, and two rectangles represent the proportion of TAPV due to covariance between the two assets. The areas of the four smaller figures sum to the area of the square, reflecting how the components of TAPV sum to the total variance. However, this representation is not sufficiently general. It assumes 1)that the variances of both assets are equal, 2)that the returns on the two assets are perfectly positively correlated, and 3)that both portfolio weights are nonnegative.

Arnold and Buchanan (2004) then provide a Venn diagram representation of a two-asset portfolio, using an approach similar to that described by Ip (2001) for the components of variance in a multiple regression. As Kennedy (2002) points out, this approach does have some pedagogical value, but can be misleading in some special cases. Also, one problem with a Venn diagram approach is that the sizes of the different areas do not correspond directly to the magnitudes of the components of TAPV. In other words, this framework is useful qualitatively, but it is not a precise quantitative representation of the relative contributions of the TAPV components.

PORTFOLIO VARIANCE AND ITS COMPONENTS: A NEW APPROACH

This section describes a general graphical approach that uses line segments to represent the magnitudes of the respective contributions to TAPV of asset A variance, asset B variance, and AB covariance, and total portfolio variance. Through the use of some simplifications described below, the approach has greater generality than that of Arnold

and Buchanan (2004). It can display components and total variance for negatively correlated assets, and for nonnegative weights.

Establishing the General Framework

Upon first glance at expression (1), it may appear that the five right hand side variables are too many to make simple generalizations about their effect on TAPV. However, we can make two simplifications. First, the sum of the portfolio weights always equals 1.0, so the two weights are not independent. Asset B weight w_B is a function of asset A weight w_A,

$$w_B = (1 - w_A). \quad (2)$$

The second simplification notes that, without loss of generality, we can specify asset A to be the asset with standard deviation greater than or equal to that of asset B. Then we can specify that asset B standard deviation s_B is a given fraction X of asset A standard deviation s_A, $0 \le X \le 1.0$, where this X-ratio is

$$X = s_B / s_A. \quad (3)$$

If X = 1.0, then asset B has the same standard deviation as asset A. If X = 0, asset B has zero standard deviation and can be considered to be a risk-free asset. In this special case, the correlation r_{AB} would also be zero, and (1) collapses to an expression for the variability of a portfolio composed of one risky and one risk-free asset. Bodie, Kane, and Marcus (2002, p. 187) combine this with a portfolio expected return expression to develop what they call the Capital Allocation Line.

Substituting for w_B and s_B, we can now represent TAPV as

$$Vp = w_A^2 s_A^2 + (1 - w_A)^2 X^2 s_A^2 + 2 w_A (1 - w_A) s_A X s_A r_{AB}. \quad (4)$$

In order to help visualize the relative effects of the three terms on the right hand side of (4) upon the TAPV it is useful to divide all terms by asset A variance s_A^2, to obtain Z_P, the "relative portfolio variance," the variance relative to that of asset A, the asset with larger variance,

$$Z_P = V_P / s_A^2 = w_A^2 + (1 - w_A)^2 X^2 + 2 w_A (1 - w_A) X r_{AB}. \quad (5)$$

The three terms on the right side of (5) represent the three components of relative portfolio variance Z_P. They can be identified in

$$Z_P = Z_A + Z_B + Z_{AB}. \quad (6)$$

These terms include two variance terms and a covariance term. The first term $Z_A = w_A^2$, the asset A variance contribution, depends only the weight of asset A in the two variable portfolio. The second term $Z_B = (1 - w_A)^2 X^2$, the asset B variance contribution, depends on asset B weight and the size of B's standard deviation relative to that of A. The final term $Z_{AB} = 2$

w_A (1 - w_A) X r_{AB}, the AB covariance term, depends on all the preceding terms plus the correlation r_{AB} between A and B. These three terms show the contributions to relative portfolio variance of: A variance, B variance, and AB covariance, respectively. It is important to emphasize that the variance units here are relative to the variance of the higher-variance asset A. For example if Vp = .75, that means that the total portfolio variance is equal to 75% of the variance of asset A. The reason for the measurement of variance in relative terms is to show that the relative contribution to total portfolio variance depends only upon the relative sizes of the variances of the two assets, as well as their correlation.

An additional benefit of this line segment approach to representing the components of TAPV is that we can also readily examine the effects of changing component magnitudes upon the minimum variance portfolio (MVP). The weight of asset A, w_{Amin}, that minimizes portfolio variance can be obtained by differentiating expression (1) with respect to w_A and setting the result equal to zero. Bodie, Kane, and Marcus (2002, p. 214) give the result as

$$w_{Amin} = (s_B^2 - C_{AB}) / (s_A^2 + s_B^2 - 2\, C_{AB}) \quad (7a)$$

where the covariance $C_{AB} = s_A\, s_B\, r_{AB}$. Using the simplifications introduced earlier, the minimum variance weight w_{Amin} can also be expressed as,

$$w_{Amin} = (X^2 - r_{AB}\, X) / (1 + X^2 - 2\, r_{AB}\, X), \quad (7b)$$

making it clear that the MVP composition depends on only two variables: correlation and relative asset standard deviations $X = s_B / s_A$.

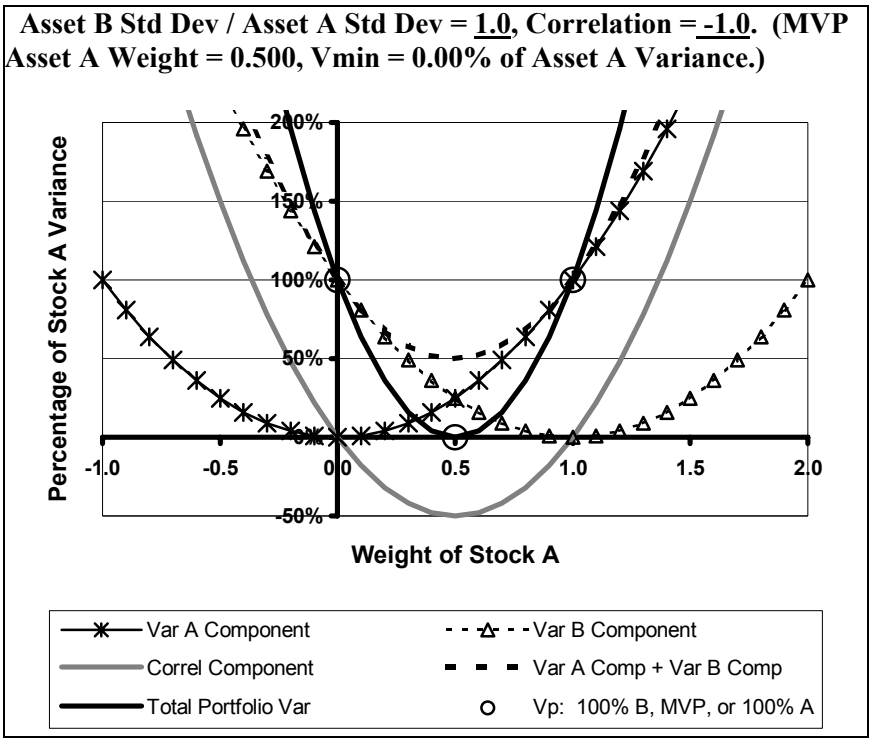
The next section discusses how the components of two-asset portfolio variance can be displayed in graphical form. This form of presentation facilitates students' understanding of how TAPV explicitly depends upon relative asset standard deviations and the correlation between assets.

GRAPHICAL ANALYSIS

This section describes the figures that we use to display the contributions of A variance, B variance, and AB correlation to relative portfolio variance. Each of the several following figures specifies a particular correlation r_{AB} and standard deviation ratio $X = s_B/s_A$ for the two assets. The horizontal axis shows w_A, the asset weight in the portfolio ranging from $w_A = -1$ to $w_A = +2$. Because the asset weights always sum to 1.0, the figures also implicitly display asset B weights

from w_B = -1 to w_B = +2. The vertical axis of each figure, ranging from –50% to 200%, displays total relative portfolio variance $Z_P = V_P / V_A$, as well as the individual components of relative portfolio variance. Two locations on the total variance line are circled on each figure for reference points, indicating the portfolio containing 100% of asset B (at $w_A = 0$), and the one containing 100% of asset A (at $w_A = 1.0$). A third circle on the total variance line indicates the weighting of the minimum variance portfolio.

Figure 1A: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



Case 1: Asset B Standard Deviation = Asset A Standard Deviation (X = 1.0)

The first three figures display TAPV components with equal asset variances for correlations of –1.0, 0.0, and +1.0 respectively.

Correlation = -1.0

Figure 1A shows the classic introductory textbook case of equal asset variances and perfect negative correlation. For the first figure, we'll provide a detailed description of each line in the figure. The solid black line indicates total variance relative to asset A variance, and equals 100% at both $w_A = 1.0$ and $w_A = 0$, because both assets are specified here to have the same standard deviation. The crosshatched line shows the contribution to total variance of the asset A variance component, and the line with triangles shows the contribution of the asset B variance component. The dark dashed line shows the sum of these two components, illustrating the total amount of contribution due to individual asset variances and not due to correlation. The gray line shows the contribution to total variance of the correlation term in the portfolio variance equation (1). This term depends on both the asset standard deviations and their correlation, and the line will vary in shape as the correlation coefficient changes. In figure 1A, the fact that negative correlation reduces portfolio variance for all nonnegative portfolio weight asset combinations can be verified by observing that the gray line is negative between $w_A = 0$ and $w_A = 1$.

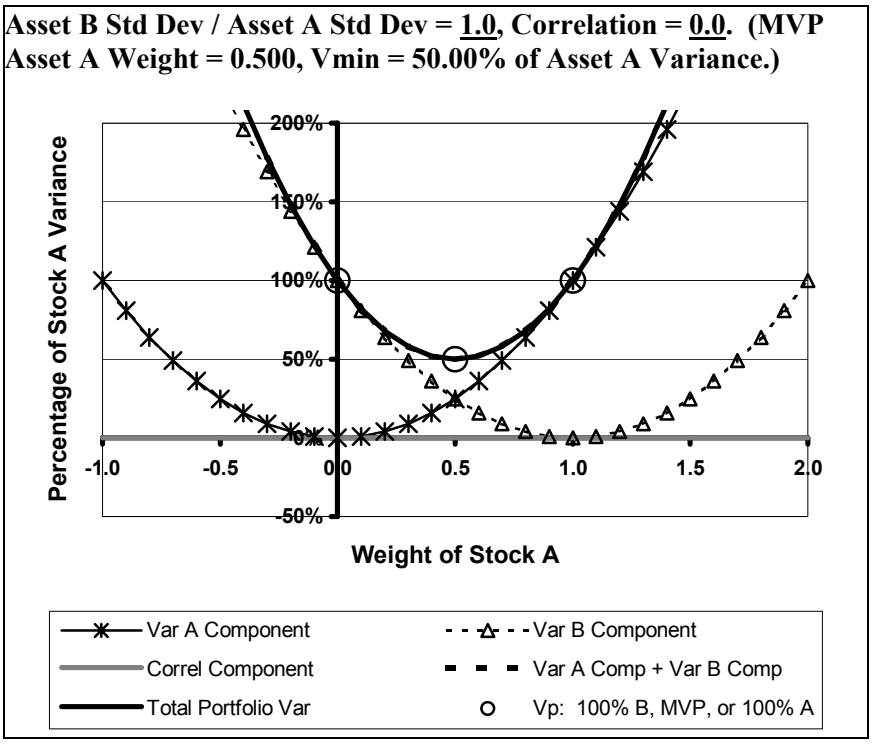
At $w_A = 0$ and $w_A = 1.0$, the circled areas show that the total variance line intersects the B variance line and the A variance lines respectively; confirming that at those two points total variance is due solely to asset B variance or asset A variance. This relation can be confirmed by noting that at $w_A = 0$, both the asset A component and the correlation component are zero, and at $w_A = 1.0$, both the asset B component and the correlation component are zero. These four intersections, which illustrate mathematical identities, occur in all subsequent figures as well.

The third circled value on the total portfolio variance line identifies the asset weights that produce the minimum variance portfolio, which are $w_A = w_B = .5$.

These figures are also useful in displaying contributions to total portfolio variance when a short position is taken in one asset, i.e., its weight is negative. When $w_A > 1.0$, $w_B < 0$, showing that asset B is being sold short. Unlike the cases with nonnegative weights described above, when either asset is sold shot, negative correlation becomes a burden instead of a benefit because the covariance term becomes positive. In Figure 1A, the position of the gray correlation line above the

horizontal axis outside the nonnegative weights ($w_A < 0$ and $w_A > 1$) region illustrates this condition.

Figure 1B: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance

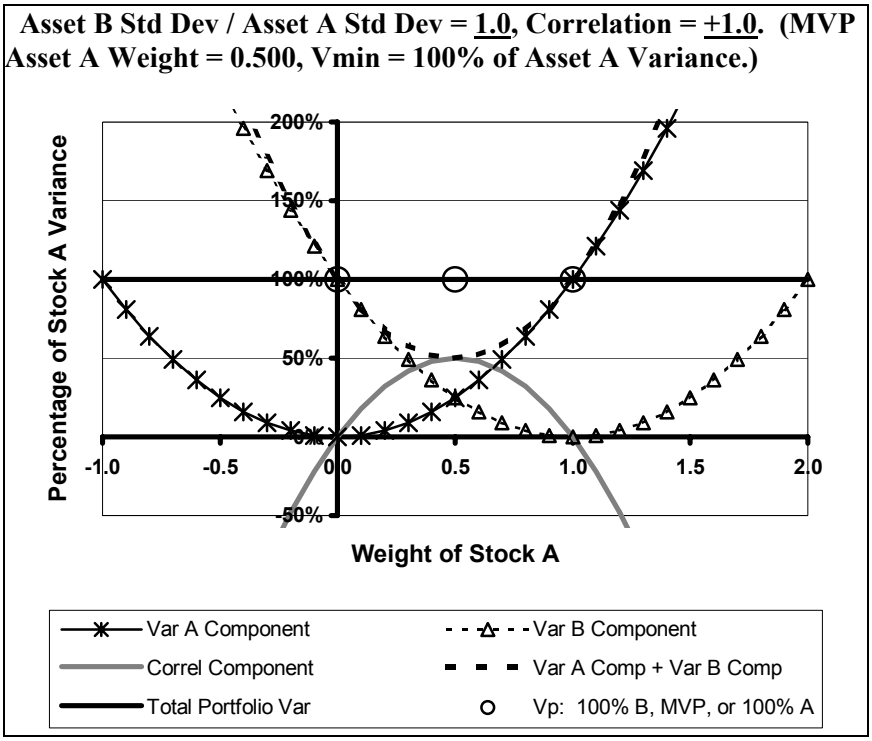


Correlation = 0

Figure 1B shows the same equal asset standard deviations as in Figure 1A, but now the correlation has increased from –1.0 to 0.0. With zero correlation, the third term of (1) becomes zero, implying that the correlation component of TAPV is also zero. This condition is readily illustrated by the gray correlation component line, which lies on the horizontal axis. In addition, the total variance line and the dotted line indicating the sum of the components of asset A variance and asset B variance are in identical positions in the figure. Also, the circled values of total portfolio variance are in exactly the same locations in Figure 1B as they were in Figure 1A.

However, the effect of changing correlation from –1 to 0 results in less portfolio variance reduction for nonnegative asset weights portfolios. The minimum variance portfolio has the same weights as before, but the MVP variance value is now 50% of asset A variance instead of zero as it was before.

Figure 1C: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



Correlation = +1.0

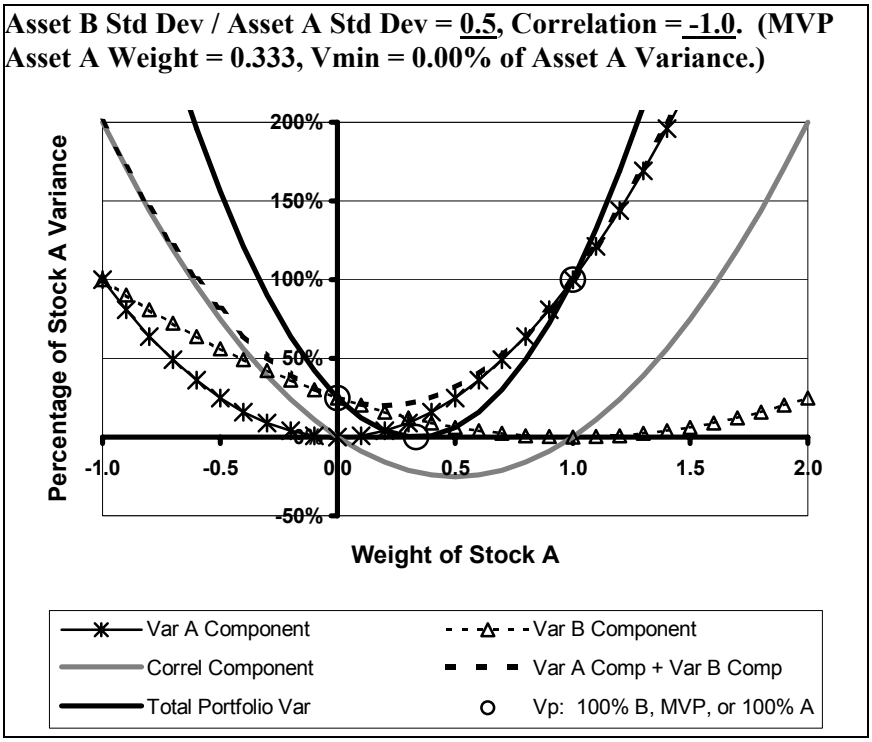
As in the first two figures, the asset standard deviations are equal in Figure 1C. Now the asset returns are perfectly positively correlated. The result of absolutely no variance reduction through diversification is well known, and is shown by the horizontal total portfolio variance line at 100% of asset A variance. However, the illustration in Figure 1C shows clearly that the horizontal total portfolio variance line is

determined by adding two opposite shaped lines—the convex upward gray correlation component line, and the convex downward dashed total A and B variance line. And only in this particular case, with equal variance assets and perfectly positive correlation, is there no unique minimum variance portfolio.

Case 2: Asset B Standard Deviation = 50% of Asset A Standard Deviation (X = 0.5)

The second series of three figures examines the components of TAPV for the same three correlations as above, but specifies asset B standard deviation to be half as large as that of asset A, implying that asset B variance is 25% of asset A variance.

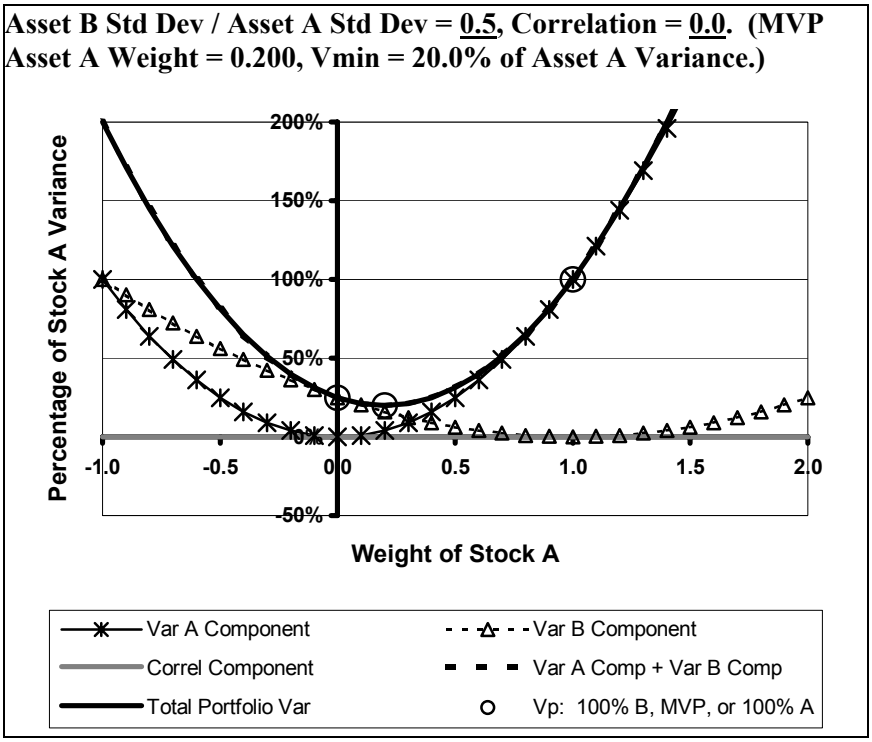
Figure 2A: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



Correlation = -1.0

Figure 2A shows the TAPV for a correlation coefficient of –1.0; the value which promises the largest diversification potential for non-negatively weighted two asset portfolios. The leftmost circle on the total variance line shows total variance for an all-B portfolio, which equals 25% of asset A variance. Now it is clear from examining the total variance line that weights for lower risk portfolios have shifted to the left, indicating that relatively more of asset B in the portfolio results in lower portfolio risk. The minimum variance portfolio value is still zero, as it is for all two-asset portfolios with perfectly negatively correlated assets; however, the optimal weighting is now at two-thirds asset B and one-third asset A. The general expression for the value of w_{Amin} that produces the MVP when correlation = -1 is $w_{Amin} = s^2_B / (s^2_A + s^2_B)$.

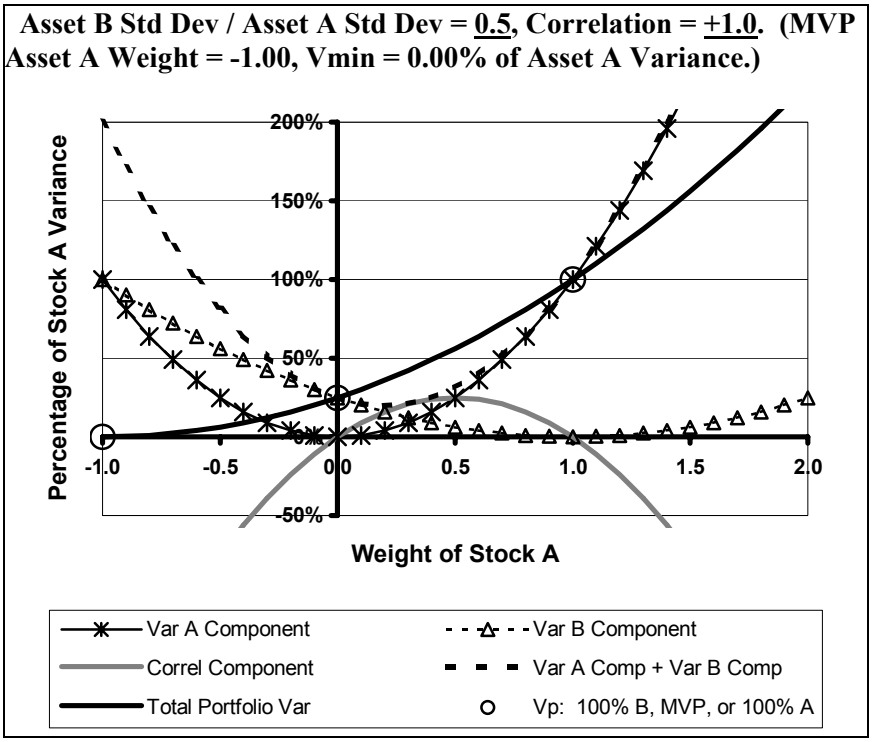
Figure 2B: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



Correlation = 0

For uncorrelated asset returns, with B standard deviation equal to half that of asset A, Figure 2B shows the TAPV components. As with Figure 1B, zero correlation implies that the correlation component is zero throughout, with the gray line again lying on the horizontal axis. Because the maximal diversification potential of perfect negative correlation is lessened with zero correlation, the MVP variance is higher at 20% of asset A variance that the value of zero in Figure 2A. Additionally, the MVP

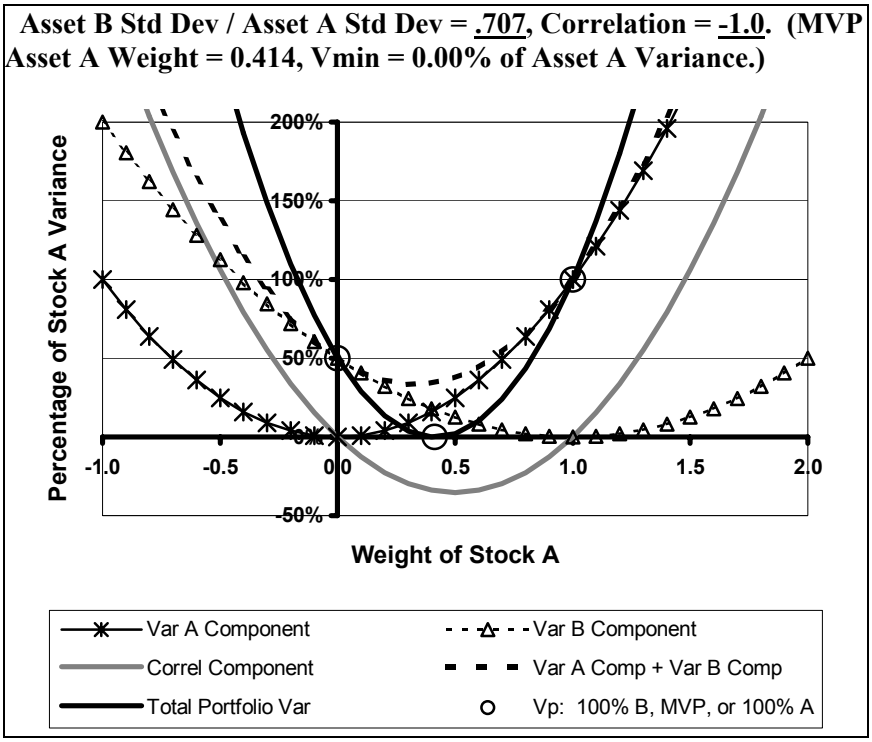
Figure 2C: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



weights have shifted more toward asset B, at 80% B and 20% A. Comparing figures 2A and 2B, students can see that this leftward shift in the position of the MVP is due to eliminating the correlation component, which always is largest at $w_A = .5$, for an given set of asset standard

deviations. This fact can be confirmed by recognizing that the correlation term in (1), $2\ w_A\ w_B\ s_A\ s_B\ r_{AB}$, will be largest in absolute value over the nonnegative weights range ($0 \le w_A \le 1.0$) for any given set of variances and correlation when $w_A = w_B = .5$. The general expression for the value of w_A that produces the MVP when correlation = 0 is $w_{Amin} = s_B / (s_A + s_B)$.

Figure 3A: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance

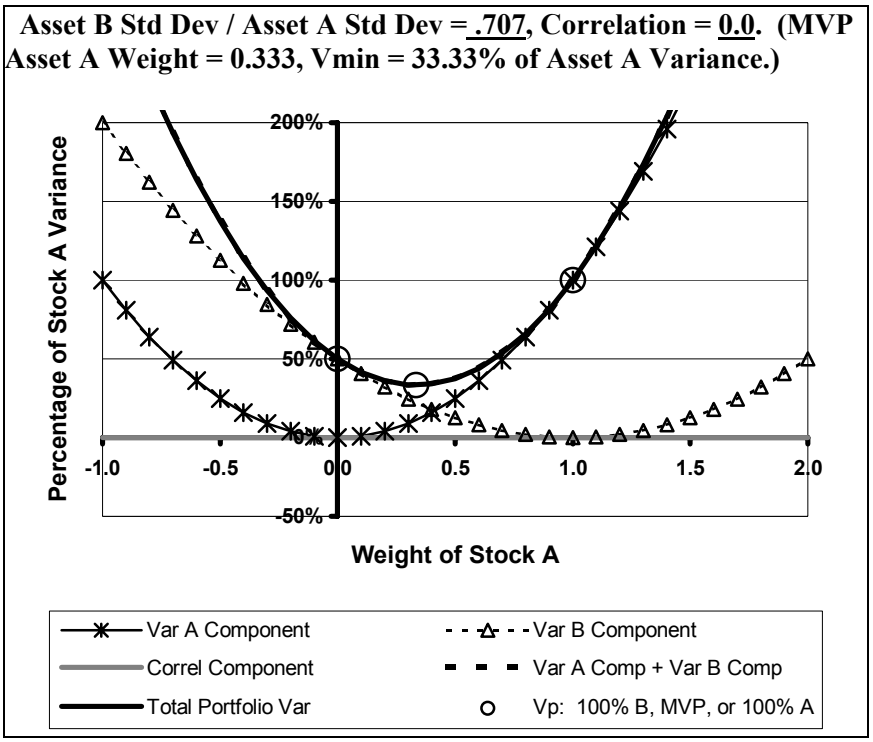


Correlation = +1.0

Like the previous two figures, Figure 2C shows the TAPV components for asset B standard deviation equaling half that of asset A, but for perfectly positive correlation between the assets. In this case, with differing asset standard deviations, there still are changes in portfolio variance as the weights are changed. It is possible to find weights that reduce the MVP variance all the way to zero; these weights

are shown at the circle as w_{Amin} = -1 (implying w_B = +2). This MVP involves shorting asset A and using the proceeds to obtain more of the lower standard deviation asset B.

Figure 3B: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



Case 3: Asset B Standard Deviation = 70.71% of Asset A Standard Deviation (X = .7071)

This case shows an intermediate position between Case 1 and Case 2 above. It results in asset B variance being exactly half of asset A variance. Comments on this case focus primarily on the differences between this case and the two previous ones.

Correlation = -1.0

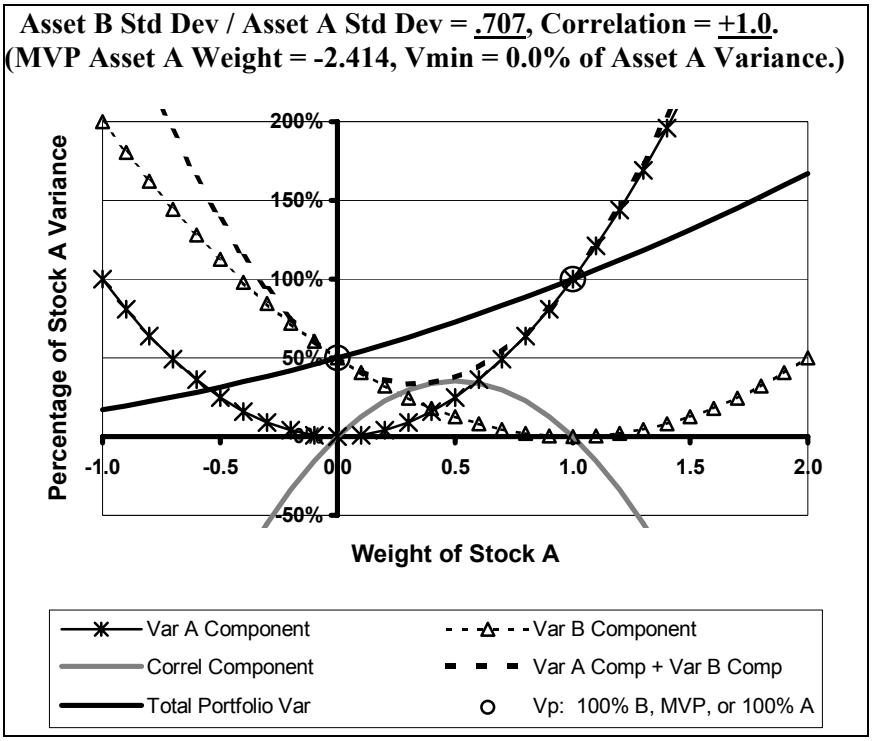
Figure 3A shows TAPV components for X = s_B/s_A = .7071 and r_{AB} = -1.0. Because the X-ratio of .7071 is between the 0.5 value of Case

2 and the 1.0 value in Case 1, the correlation component of TAPV lies between those of Case 1 and Case 2. The MVP asset A weight is 0.414, between the 0.5 for X = 1.0 and 0.333 for X = 0.5.

Correlation = 0

For zero correlation, the TAPV components are displayed in Figure 3B. Because the asset B relative standard deviation is higher than it was in Case 2, there is less risk reduction potential provided by asset B, and consequently the MVP asset A weight increases to .333, between the values of 0.5 for X = 1.0 and 0.2 for X = .5

Figure 3C: Components of Two-Asset Portfolio Variance as a Percentage of Asset A Variance



Correlation = +1.0

Figure 3C shows the TAPV components for perfectly positively correlated asset returns. This figure illustrates a different situation.

Perfect positive correlation actually results in increased variance for non-negative portfolio weights, but reduces risk for a portfolio with on negative weighting. Figure 3C suggests that the MVP in this situation is outside the non-negative weights range at a computed value of w_{Amin} = -2.414, implying w_{Bmin} = 3.414. These points occur to the left of the visible area of Figure 3C.

MVP COMPOSITION AS A FUNCTION OF X-RATIO AND CORRELATION

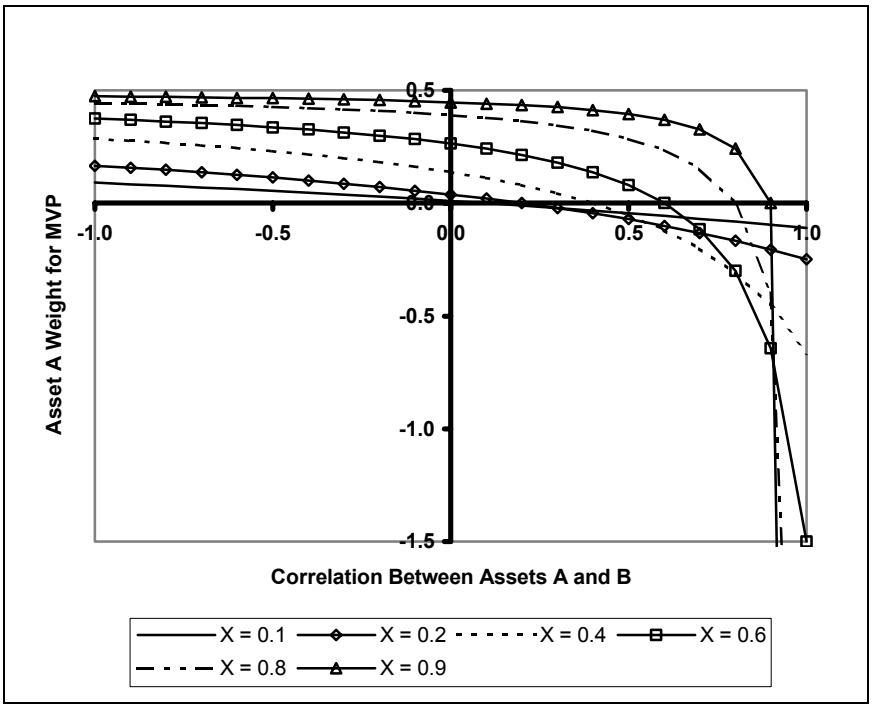
The preceding figures have displayed the TAPV components for three different correlations and three different asset standard deviation ratios ($X = s_B/s_A$) over the range of possible asset A weights from –1.0 to +2.0. For each of these nine cases, we have identified the minimum variance portfolio.

What is the general relation between MVP composition, correlation, and standard deviation ratio? Figure 4 provides graphical insights, showing how the MVP asset A weight w_{Amin} depends upon correlation for various values of X-ratios from 0.1 to .09. The non-negative portfolio weights region, from w_A = -0.5 to w_A = 0.5 on the vertical axis, includes most of the minimum variance portfolios, but not all of them.

For these relatively infrequent cases of MVPs with weights of opposite sign, Figure 4 shows clearly that they occur only if larger X-ratios (implying nearly equal asset standard deviations) are combined with correlations above 0. Note that an example of a negative weight MVP was shown in Figure 3C above, where X = 0.7071 and r_{AB} = 1.0, which resulted in w_{Amin} = -2.414.

It is also apparent from Figure 4 that, for all X-ratios, negative correlated asset returns imply the MVP will have non-negative weights.

Figure 4: Two-Asset Minimum Variance Portfolio Asset A Weights vs. Correlation for X-Ratios (=Std Dev B / Std Dev A) from 0.1 to 0.9



DISCUSSION

The purpose of this paper is to provide students with a guide to visualize how the components of two-asset portfolio variance change as a function of correlation and relative asset standard deviations. This should help their intuition regarding the fundamental expression for portfolio variance for any two-asset portfolio,

$$V_P = s_P^2 = w_A^2 s_A^2 + w_B^2 s_B^2 + 2 w_A w_B s_A s_B r_{AB}. \quad (1)$$

This methodology allows instructors to develop illustrations showing how the minimum variance portfolio weights change for different values of correlation r_{AB} and standard deviation ratio s_A/s_B. It also clarifies the (sometimes counterintuitive) contributions of the components to total portfolio variance in cases where one of the two assets has a negative portfolio weight.

One shortcoming of this approach for representing two-asset portfolio variance equation components as lines is that it cannot be easily extended to portfolios with more than two assets. Despite this deficiency, we believe the method we have introduced is still a useful addition to the arsenal of pedagogical tools instructors can use to help students see exactly how diversification works in portfolio analysis.

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CAN THE VOEKS METHOD IMPROVE SCORES ON ESSAY TESTS?

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ABSTRACT

The Voeks Method has been demonstrated to improve performance on multiple choice tests, but no attempt has been made to understand the range of its learning effectiveness. This article reexamines the usefulness of the Voeks Method in the context of the essay question exam. The Voeks Method is derived from a learning process based on outlining the material to be learned along with systematic revisions, updates, and reviews of the outline. To test whether this learning method is applicable to performance environments involving critical thinking, we conducted a controlled field experiment using undergraduate students who participated in a study that involved their taking essay tests with or without previously participating in the Voeks Method. An analysis of their test scores showed that when they used the Method their scores improved relative to when they did not use it. The results are discussed and ways of improving the effectiveness of the Voeks Method are proposed.

INTRODUCTION

The present article relates to a resurgence of interest in research on formal learning methods (McCormick, 1993) and focuses on ways to make learning theoretical concepts a more lasting, useful, and profound experience. As Carl Rogers has theorized (see a recent version of his work in Rogers and Freiburg 1994), the total experiential learning process occurs over four different stages: experience, reflection, abstraction, and testing. Formal learning involving abstract information such as theoretical concepts corresponds to the third or abstraction stage of the overall process. Learning by experience outside the classroom is a complement to theoretical learning, but is slower and less structured than what we learn in the classroom. However, because of its ready application to real-world situations, the study of applied learning and related methodologies (e.g., active learning, experiential learning) has

taken the front seat, while research on formal and structured learning of theory and relationships has taken a back seat.

This paper focuses on ways to use the formal methods in a more active and experiential manner. The problem is how to deal with learning the abstract information contained in a textbook that will eventually be applied to real world situations, when it may be difficult to grasp due to the range of its coverage, or difficult to comprehend due to complexity or sheer level of abstraction. To study this problem, we turn to a learning method introduced in a book by Voeks (1957) over 50 years ago, when formal learning was the mainstay of college education. Her title "On Becoming an Educated Person" is a play on the title of Carl Roger's famous piece, "On Becoming a Person", indicating her awareness of the need for new approaches to learning. Long since forgotten, it was reintroduced in a recent article (Hansen 2002) that showed that it could be used by entire classes of students rather than just individuals to improve learning in basic undergraduate business curriculum, as demonstrated by improved scores on multiple-choice exams. The present article extends this research by assessing whether the Voeks method will improve performance in advanced level courses involving essay tests with critical thinking type questions as the criterion as well as the multiple choice tests demonstrated in Hansen (2002). An empirical study to be presented later in this article shows that the Voeks method is indeed suitable for a broader range of uses.

BACKGROUND

The theoretical explanation for the underlying mechanism by which the Voeks Method achieves its results was presented in Hansen (2002). However, we also review that process here after summarizing the Voeks Method. In the Voeks Method the learner prepares the material to be learned before class and writes a "reading log" or "diary" using the hierarchical format of an outline for the material of the upcoming lesson (e.g., chapter of the week). The outline should proceed with major headings, minor headings, indentation, and, whatever other aids, that are necessary to achieve a meaningful, but brief and hierarchical representation of the material. Organization is important, especially the hierarchical nature of the outline, since this is the main advantage of outlining as opposed to merely taking notes. The hierarchical aspect, as we'll explain later, allows the learner to group the information into meaningful chunks, which facilitates learning. Prior to

class the learner should arrive early enough to review the material in the outline that will be covered in the day's session. During class the learner should take notes in blanks left earlier for that purpose in order to cover anything important added in the class discussion by the teacher or the other students. After class the learner should review the notes to make sure they are intelligible and are in the right location in the hierarchy of the outline. Outside of class, the learner should incorporate any experiences that occur that may enrich the outline. The learner should use the outline to study for exams by memorizing the first three levels of the outline hierarchy, level by level, focusing more on inter-relationships and organizations than on fine details. The deeper meaning needed for critical thinking will automatically be accessible due to cueing from memory if the basic material has been prepared as indicated above.

As the semester progresses, the outline becomes a log or diary containing knowledge related to the material to be learned in the different modules of the course. It should contain all the information needed to prepare for any type of test. This is due to its comprehensive nature (it should not be a compendium, just a summary of key points in hierarchical format), and to its hierarchical structure. This structure, plus the repetitive use of the outline and updating relate to three key factors known to influence learning: chunking (hierarchical organization), repetition (reviewing), and elaboration (updating). We will now go over the reasons that these aspects of the Voeks outlining method are likely to enhance learning of higher-level information tested under essay question conditions.

THEORETICAL UNDERPINNINGS

The theory that Voeks used to describe the mechanism by which learning occurred was couched in terms of learning theory, the dominant theory of that era. However, this summary will attempt to recast this mechanism in terms of memory theory, focusing on the three major aspects of cognitive development and memory that are facilitated by the Voeks Method.

First Memory Concept: Rehearsal

Since distributed learning consists of repetition of the task, rehearsal is the memory correlate of repetition in distributed learning. The Voeks Method depends on it heavily. In rehearsal, a concept is

repeated many times. Interestingly, the form of rehearsal influences memory (Woodward, Bjork, and Jongeward 1973). When rehearsal is combined with critical thinking this allows the things being learned to be integrated more completely into memory. The new information is linked more deeply into the network of existing information in memory and thus, ensures more complex (deeper meaning) and, extensive neural connections. Since new information may relate to material already in memory, when existing material is recalled this establishes an automatic link between new and old material. This is also because the existing material must be retrieved and rehearsed during the study of the new material, developing a stronger memory trace for the new material as well as the old, and making it easier to retrieve the new item from memory. Finally, rehearsal improves and strengthens memory traces making them more durable over time, as pointed out in the review by Postman (1975). This kind of learning cannot be acquired by cramming for tests, a short-term learning condition. Thus, making rehearsal a part of the learning process means that an item can be encoded in memory more easily and with increased and lasting comprehension.

Second Memory Concept: Chunking

Chunking is the second important memory concept (Anderson and Bower 1972). It explains the way people unconsciously or consciously use "labels" to make it easier to store and retrieve information in memory. A person's name is a mnemonic device or chunk that helps us remember the basic characteristics of an individual such as looks, task situation (e.g., social, family or work), economic relationship (does he owe you money), etc. Each of these characteristics can in turn serve as a chunk, and so on. Through chunking, many small pieces of information can be combined into a few larger pieces, thus making chunking like opening a large drawer to get to folders in which there are files, in which there are reports, and so on. The chunk or label is a memory cue. It acts to open the contents of the chunk. The contents are the more specific pieces of information. Chunking is how people manage to memorize entire books word for word (e.g., the Koran).

Since an outline naturally organizes material in chunks through its hierarchical nature, the Voeks Method is very much connected to chunking. The organization of the outline allows the major headings/topics of the outline to be the most general chunks, and the indented topics become smaller chunks, and so on. As an example, think

of an exploding diagram or model of the human body. An arrow pointing to the brain leads to another more highly detailed drawing of the neurons, and so on. One of the key learning processes for students is to make decisions about the meaning, importance, and generality of topics in order to develop an outline of each chapter or article they read. Classifying information in this manner is an essential part of the learning process and it is at this point that students turn information into knowledge.

Instead of listing the contents of a chapter in order of appearance, an outline that facilitates chunking should contain minor topics nested under major topics. This type of outline allows chunks to be developed in a way that coincides with natural memory structures. Doing this facilitates the storage as well as the retrieval of information. Although the organization in an outline seems to relate to chunking, a key point is that the outline should do more than just summarize the text. It should not merely be a device to facilitate memorization. In order for it to be a tool for both memorization and critical thinking it should incorporate the reader's personal interpretation of what he or she has read. This transforms the outline into a well-organized account of what has happened. We try to emphasize this by using names like "reading log" or "course diary" instead of outline, which has a negative connotation. Any interesting items that the learner encounters during reading, lecture, project work, or personal experience can be recorded in their own words and entered into their "log". Linking new information to existing knowledge in this way helps integrate new information into memory by making it more meaningful.

Third Memory Concept: Elaboration

The idea of integrating and linking new material to existing material in memory is related to the third memory concept, elaboration (Craik and Lockhart 1972). Elaboration is related to chunking but is a broader concept. Elaboration is similar to the process of opening up chunks, but is not necessarily used only for chunks, in that information outside the chunk may also be retrieved. The spreading activation system (Anderson 1983) is a model of memory that assumes that memory is organized in layers and networks and that fine details are stored in deeper layers. Gross details are organized as nodes that represent specific ideas in the network. This is why the concept of layers is a useful analogy for understanding chunking. Elaboration is also part

of the spreading activation system of memory in that one activated item leads to another, depending on the strength of the association and the number of associations. As you think more deeply about a topic, more items seem to be recalled on the topic. However, spreading activation can move across the network as well as going more deeply into it. This is because as items become stored in memory they fall into place within existing memory structures (e.g., the nodes of the network) according to where they fit best. Thus, new items are stored nearest to similar items in the network even though they get a coding that preserves their uniqueness. It is important to note that a key source of repetition and elaboration is lectures, labs, class discussion, and personal experiences. These should enrich the concepts acquired from reading and outlining and allow the learner to elaborate on them by updating their outlines with this new information. This strengthens the meaning of the new material by providing links to existing items, and it embeds the new information more solidly in memory.

The question that we are studying in this article is whether the Voeks Method is useful only as a memorization device or as a tool for more analytically related learning tasks such as the critical thinking and problem solving required in essay tests. We propose that use of the outlining method helps establish the basics more effectively and more efficiently. This allows learners to devote more time to higher level objectives such as problem solving and critical thinking. Moreover, the elaboration aspect of the Voeks Method should make deeper thought processes easier for the learner. The Voeks Method should be given to students at all levels, since it has a wide range of application and allows a more complete development, understanding, and use of the topical material to be learned in a typical academic course. This applies to courses that can seem daunting because of the range of material covered as well as to courses that seem daunting due to the complexity of the material. Thus, we propose that the Voeks Method will improve student performance on essay tests where critical thinking and verbal problem solving are required.

The details of an empirical study designed to test the effect of the Voeks Method on essay test performance are now presented. In particular, the research question is whether this method improves student performance on essay exams relative to that of the standard method based on the vocabulary and questions offered by textbook authors.

METHODOLOGY

Subjects and Design

The experiment was performed using students from two separate sections of an upper division marketing course, International Marketing, who were attending an urban state university. Each section was randomly assigned to the Normal group (n=26) and the other to the Reverse group (n=38). The students were primarily daytime commuter students; about 15% were non-traditional students (over 25), and the average age was 24.2 years. They were fairly evenly divided between males and females (52% male), and the sample was fairly homogeneous, since 95% of the students in both sections were African-American with the remaining students being a mixture of white, Hispanic, and Asian.

Regarding design, we designate this experiment as exploratory in nature, since it lacks some of the feature that a more sophisticated experiment would contain. The treatment (the Voeks Method) was given either during the first five-week segment of the semester (Reverse group), or during the second five-week segment (Normal group). We used two groups each with a different treatment order to control for different effects of accommodation to the instructor's testing style and other unobserved factors that might not otherwise be experimentally controlled.

The experiment was designed so that students in each group received a different treatment during the first five-week segment of the course (one got the Voeks Method and the other did not). At the end of the first five-week segment both groups were tested using the same essay question test (first test). The appendix contains questions of the type used in both first and second tests, and illustrates the complex nature of the questions used in the tests. In the second five-week segment students in each group now received the opposite treatment condition, and were tested afterward using an essay question test based on the material in the second five weeks of the course (second test). It was expected that students in the Reverse group who received the Voeks Method in the first segment would outperform students in the Normal group on the first test. It was expected that the Normal group (who received the Voeks Method in the second segment) would score higher than the Reverse group on the second essay test.

This design involves a within-subjects variable (each subject produced a score on test one and test two), and a nested variable (subjects could not be randomly assigned to the Normal or Reverse groups). This is a complex design requiring a substantial number of degrees of freedom; therefore a simpler but meaningful approach for analysis was sought due to the relatively small number of degrees of freedom available in the study. The final statistical analysis (see the results section) consisted of a separate paired-comparison t-test across test one and test two for each group, and an independent samples t-test across Normal and Reverse groups for each test.

Procedure

In the first five-week segment of the course students in the Normal group were instructed to answer questions at the end of each chapter in the course textbook, while students in the Reverse group were introduced to the Voeks Method. The same instructor taught both sections so that the method of instruction was the same for all students in the experiment. At the end of the first segment, the first test was given to both groups. The first test (essay questions) was identical for the two groups, and covered only material from the textbook to avoid favoring either group due to differences in class discussion.

In the second five-week segment of the course, members of the Normal group were introduced to the Voeks Method, and the Reverse group was asked to answer questions at the end of each chapter in the course textbook. At the end of the second five-week period, a second essay test was given (essay questions on other chapters in the text) and was identical for the two groups. The essay tests were graded by two students who had previously taken the course and received a grade of A. They were unaware of the students' names or the conditions of the study.

A description of the administration of the outlining method is adapted from Hansen (2002):

The outlining method was explained to the students and it entailed six steps shown in Table 1.

Table 1: The Six-Steps In The Enhanced Outlining Process

1) Outline the material to be learned for the lesson (e.g., book chapter, article, etc)
2) Preview this outline before class
3) Take notes during class session
4) Review and update the outline using the class notes after each class
5) Elaborate the outline with other learning experiences
6) Use the outline to study for the test

These were: 1) outlining or taking written notes of personal significance (what was new, interesting, or seemed important) on the material for the upcoming lesson (e.g., book chapter) and keeping these in a reading log or class diary that they could carry with them; 2) previewing this outline before class; 3) taking notes during class session; 4) updating the outline after class using the class notes; 5) elaborating the outline with relevant thoughts or experiences outside of class; and 6) using the outline to study for the exam by memorizing the first three levels of the outline hierarchy, level by level, focusing more on inter-relationships and organizations than on fine details. (The latter will automatically pop up when the rest is in place, given that the preparatory work has been done in steps one to five.)

Students were told that it would take two to three hours to outline a chapter, but that the time required would decrease with practice. To motivate use of the method, they were told that once the outline of a chapter was completed, the textbook would no longer be needed for that material, except perhaps to check the veracity of the outline, or for fine-tuning, examples, and cases. Furthermore, since they would be able to use their outlines to study for tests at a great savings in time, this savings could be conveniently used to work on projects or other assignments due later in the semester.

Students were told that it would take about the same time to outline a chapter as it would to read it carefully once they got the hang of it. To motivate use of the method, they were told that once the outline of a chapter was completed, the textbook would no longer be needed for that material, except perhaps to check the veracity of the outline, or for fine-tuning, examples, and cases. Furthermore, since they would be able to use their outlines to study for tests at a great savings in time, this

savings could be conveniently used to work on projects or other assignments due later in the semester.

In addition, the instructor checked the outlines at the beginning of each class session when the Voeks Method was being used. Students learned how to do the outlines in one or two tries and received feedback from the instructor on how to improve and use the Voeks Method. In the Reverse group students were instructed not to do any more outlining after the first test; instead questions assigned from the book were checked with the same periodicity that those in the Voeks Method condition received. This was to ensure that the differential attention paid to the students in the Voeks Method condition could not account for the difference in students' performance on the essay tests. Since the outlines were called "reading logs" to avoid the stigma of being an "outline" no special format other than indentation was required. This was intended to encourage students to focus on their own particular learning style and to draw students into the material by virtue of becoming more involved with their outline.

RESULTS

Table 2P: Means of Essay Test Scores

	First Test	Second Test
Normal group[1] (n = 26)	54.6% (28.0)	75.4% [b] (15.3)
Reverse group[2] (n = 38)	76.8% [a] (35.0)	51.8% (21.7)

[a] significant difference across groups, $p < .01$.
[b] significant difference across tests, $p < .01$.

Notes: 1) Voeks Method prior to the second test only.
2) Voeks Method prior to the first test only.

Table 2 presents the means for the Normal and Reverse groups on the first and second tests. The paired-samples t-test of differences described above revealed a significant difference across groups for the first test ($t[62] = -2.806$, $p < .01$) and the second test ($t[62] = 4.76$, $p < .01$). Similarly there was a significant difference across tests for the Normal group ($t[25] = -3.19$, $p < .01$) and the Reverse group ($t[37] = 5.45$, $p < .01$).

Looking at the group means, the Voeks Method students in the Reverse group had significantly higher scores on the first test than did the students in the Normal group, who did not use the Voeks Method for that test ($M_{\text{normal}} = 54.6\%$, $M_{reverse} = 76.8\%$). The opposite finding occurred for the second test where use of the Voeks Method occurred for the Normal group ($M_{\text{normal}} = 75.4\%$, $M_{reverse} = 51.8\%$). A similar change in test score occurred depending on whether the Voeks Method had been used prior to the second test (Normal group) ($M_{\text{normal-withtout}} = 54.6\%$, $M_{normal\text{-}with} = 75.4\%$) or prior to the first test (Reverse group) ($M_{\text{reverse-with}} = 76.8\%$, $M_{reverse\text{-}without} = 51.8\%$). Although the questions on the first and second tests concerned different course topics, the difficulty across tests was assessed by the instructor to be approximately the same. The above results indicate that the Voeks Method improves scores on essay tests since students using the Method had higher scores compared to when the Method was not used.

DISCUSSION

This study is an empirical test of the efficacy of the Voeks Method in improving scores on essay tests that involve critical thinking and synthesis of concepts from different topics in the course. It was conducted as an extension of an earlier study (Hansen 2002) that assessed the effectiveness of the Voeks Method on student performance within the context of multiple choice tests. We found that that reading logs with information organized in a hierarchical manner are capable of improving student scores on essay tests for more advanced upper division courses. This result supports the proposal that this method is not merely a superficial aid to memorization, since it seems to improve and consolidate knowledge for use in both critical thinking and problem solving.

This is an important finding for those whose are concerned about their students' ability to master abstract concepts that will eventually

allow them to become problem solvers, as well as possessing an analytical acumen that will improve their ability to examine and deal with global issues. The importance of learning substantive information cannot be overstated as we enter a period of American history where the students of this country, even the ones from top universities, are falling far short of their overseas counterparts. Hopefully, this research will rekindle interest in the study of how to learn theory and how to deal with abstract situations, not just application. This is not intended to denigrate methods and studies that focus on experiential aspects of learning. The Voeks Method incorporates an experiential learning component into its framework when students update the "reading log" (outline) from their experiences outside the classroom; an active learning component occurs during the initial outlining process.

Several issues remain, however, before one can expect widespread adoption of the Voeks Method. One issue is how to get students to see the value of doing this, since the hard work has to be done up front, which is different than what many students actually do (i.e., leaving study to the last moment before tests). Another idea is to try to get students to use their own manner of annotating the material to be learned so that the outline corresponds more to their own learning style.

Although every attempt was made to carefully assess the impact of usage of the Voeks Method on essay test scores, this study is limited by the nature of the design, and in particular the lack of complete randomization due to the nested nature of the study. A new methodology needs to be devised that will improve the quality of the statistical tests used here in order to assess the effectiveness of the Voeks Method more accurately. Another limitation is that these conclusions are based on the results of only one study thus inviting caution in their use and interpretation. Another area for future study is to see whether the Voeks Method can be applied to a more quantitative course such as statistics or accounting.

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Appendix: Sample Essay Test Questions

1. Is it possible that strategic global partnerships could reduce global competition in the long run? Discuss.

2. Discuss the trend in which an increasing number global products are standardized as opposed to customized, and how this relates to global marketing strategy. Is this good marketing?

3. What is the difference between globalization and localization? Give examples of products that fall into each category. When should you globalize and when should you localize?

4. What is the driving force behind globalization? What are some of the tradeoffs that firms must make when considering whether to go global?

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STUDENT ATTITUDES TOWARD LAPTOP COMPUTERS- A BASELINE STUDY-

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ABSTRACT

The controversy continues on college campuses as to what "level of technology" is affordable and what form of technology access supports maximum student learning. Of particular interest is the type of computers made available to students, fixed units or laptops. The prices of both types are rapidly falling while the capability and capacity continue to increase. This study focused on students' attitudes toward laptop computers, the financial assistance they would need to support the adoption of laptop computers, and their beliefs regarding the benefits provided by laptop computers.

INTRODUCTION

Colleges and universities are faced with the continuing march of technological change and innovation. In earlier times the availability of personal computers in computer labs was the cutting edge. In recent times the ever-decreasing price of laptops and the innovation of wireless communication has caused educational institutions at all levels to re-examine the level and type of computer technology they make available to their students. This study focused on students at a Midwestern university. This university offers extensive availability of personal computers, both in computer labs and in dormitories. This university is known for a high level of technology in the classrooms, and throughout the campus. It is considering converting to a laptop computer hardware system. The purpose of the study was to measure the readiness of the student body to accept the new system.

REVIEW OF LITERATURE

There seems to be little debate regarding the value of universal laptop- type technology for college students. Approximately three dozen

universities have adopted laptop requirements for students and there is a wealth of information analyzing the impact. Wake Forest University instituted a laptop program with freshman during the Fall of 1996. Longitudinal studies since that time concluded the computer-enriched environment "generated a measurable change in student attitudes about computers. The students who received laptops expressed more positive feelings about computers in general, their role in teaching and learning, and the opportunity they provided for better communication between faculty and students" (Mitra & Steffensmeier, 2000, pp. 417-433).

Similarly, a longitudinal study of the laptop computer program at Grove City College concluded "not only was there a positive change in attitudes after the program was initiated, but digital divides based on sex and field of study were diminished during the students' time on campus" (Finn & Inman, 2004, pp. 297-317). Winona State University and Valley City State College each have several years experience with laptop programs and publish annual updates of their longitudinal information on their websites. Student attitudes continue to be persuasive in supporting the installation of laptop programs.

METHODOLOGY

During the fall semester of 2004, all on-campus students at a rural midwestern university were surveyed using electronic means. A total of 4641 questionnaires were posted and 620 were completed resulting in a return rate of 13.4%. The return rate was low, probably as a result of poor timing; the data were gathered shortly after the semester began. Although the returns were low, they represent the student-body in terms of the distribution of classes and college major.

PRESENTATION OF DATA

The first question posed was "Do you own a laptop computer?" Thirty four percent of the students reported they owned a laptop.

Table 1: Laptop Ownership

	Number	Percent
Own a Laptop	213	34%
Do Not Own	407	66%
Total	620	100%

The most popular type of laptop was a Windows-based PC. Ninety-two percent of those students who owned a laptop reported owning a Windows-based PC.

The students were then asked their preference of hardware for student computer laboratories on campus. The students were nearly evenly split between preference for laptops or fixed hardware.

Table 2: Preference for Lab Hardware

	Number	**Percent**
Strongly prefer fixed units	89	14%
Somewhat prefer fixed units	98	16%
Neutral	245	40%
Somewhat prefer laptops	94	15%
Strongly prefer laptops	93	15%
Total	619	100%

The focus of this study was to gauge the impact of adopting a laptop computer environment for this university. Students were asked how the requirement that they own a laptop would have impacted their decision to attend this university. Overall the response was surprisingly negative. Fifty-seven percent of the students reported that if they had been required to own a laptop, it would have had a negative impact on their decision to attend this university.

Table 3: Response to requiring student to provide laptops

	Number	Percent
Strongly positive	28	5%
Somewhat positive	58	9%
Neutral	178	29%
Somewhat negative	248	40%
Strongly negative	108	17%
Total	620	100%

Interestingly, although all classes were negative toward the requirement of owning a laptop, freshmen were less negative than other classes.

Table 4: Attitude toward laptop requirement by class

			Q8					
			Freshman	Sophomore	Junior	Senior	Other	Total
Q4	negative	Count	68	86	95	67	35	351
		Expected Count	84.6	80.6	82.3	74.2	29.3	351.0
	neutral	Count	51	34	30	47	12	174
		Expected Count	41.9	39.9	40.8	36.8	14.5	174.0
	positive	Count	28	20	18	15	4	85
		Expected Count	20.5	19.5	19.9	18.0	7.1	85.0
Total		Count	147	140	143	129	51	610
		Expected Count	147.0	140.0	143.0	129.0	51.0	610.0

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.158[a]	8	0.007
Likelihood Ratio	21.268	8	0.006
N of Valid Cases	610		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.11.

There was also a significant difference in the response based on student major. Again, all majors were negative toward the requirement of laptop ownership; however, students majoring in Business and Leadership were less negative than other majors.

Table 5: Attitude toward laptop requirement by major

			Q10					
			Arts & Sciences	Business & Leadership	Education	Health & Life Sciences	Graduate School	Total
Q4	negative	Count	107	88	48	84	24	351
		Expected Count	109.3	105.9	42.6	74.2	19.0	351.0
	neutral	Count	57	65	14	32	6	174
		Expected Count	54.2	52.5	21.1	36.8	9.4	174.0
	positive	Count	26	31	12	13	3	85
		Expected Count	26.5	25.6	10.3	18.0	4.6	85.0
Total		Count	190	184	74	129	33	610
		Expected Count	190.0	184.0	74.0	129.0	33.0	610.0

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.091[a]	8	0.029
Likelihood Ratio	17.56	8	0.025
N of Valid Cases	610		

a. 1 cell (6.7%) have expected count less than 5. The minimum expected count is 4.60.

Another measure of intensity of feeling toward requiring students to own laptops was to ask present students what their response would be if they were required to own a laptop by the 2005-2006 school year. Less than one-third said they would be comfortable with that requirement which is about the same number that now owns a laptop. (See Table 1.)

Table 6: Reaction to requiring laptop ownership by Fall 2005

	Number	Percent
Leave the University	90	15%
Stay but feel abused	337	55%
Happily stay	191	31%
Total	618	100%

The response to this question was not related to the class or the major of the student.

Students were further questioned on the amount of financial assistance they would need if they were required to purchase a laptop costing $1500. Nearly all the students reported they would need considerable assistance; more than half indicated they would need financial assistance for 100 percent of the cost.

Table 7: Financial assistance required to purchase $1500 laptop

	Number	Percent
100% of the cost	347	56%
75% of the cost	147	24%
50% of the cost	83	13%
25% of the cost	9	1%
0% of the cost	34	5%
Total	620	100%

It was interesting to note, although freshman would need considerable financial assistance, they would need less than upper classmen.

Table 8: Financial assistance required by class

			Q8					
			Freshman	Sophomore	Junior	Senior	Other	Total
Q4	100% of the cost	Count	60	92	86	74	30	342
		Expected	82.4	78.5	80.2	72.3	28.6	342.0
	75% of the cost	Count	39	31	35	32	8	145
		Expected	34.9	33.3	34.0	30.7	12.1	145.0
	50% of the cost	Expected	33	13	16	14	7	83
		Count	20.0	19.0	19.5	17.6	6.9	83.0
	25% of the cost	Expected	5	0	2	2	0	9
		Count	2.2	2.1	2.1	1.9	.8	9.0
	0% of the cost	Expected	10	4	4	7	6	31
		Count	7.5	7.1	7.3	6.6	2.6	31.0

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.498[a]	16	0.002
Likelihood Ratio	38.176	16	0.001
N of Valid Cases	610		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is .75.

Finally, students were asked how beneficial a personal laptop would be to them at the university. Eighty-five percent of the students thought a laptop would be beneficial to them.

Table 9: How beneficial would a laptop be to you at the university?

	Number	Percent
Extremely beneficial	266	43%
Somewhat beneficial	258	42%
Not beneficial	96	15%
Total	620	100%

There was no relationship between the benefit of owning a laptop and the class or major of the student.

SUMMARY

The move toward a laptop-based university and away from desktop computers is a major change and will likely impact both students and faculty. The purpose of this study was to measure student attitudes toward and their assessment of laptop computers.

The first finding was that more than one-third of all students already owned a laptop, thus only two-thirds would likely be affected by the change to laptops. The one-third who already owned a laptop preferred laptops over fixed units.

Students were generally negative regarding the university requiring them to own laptops. Fifty-seven percent reported a negative attitude toward that requirement. A follow-up question revealed that fifteen percent of the students said they would leave the university if they were required to provide a laptop and fifty-five percent said they would stay but "feel abused."

If students were required to own laptops, nearly all would require financial assistance with more than one-half needing 100 percent assistance.

The only data that supported the adoption of laptops was that students reported laptops would be beneficial to them at the university. Eighty-five percent said laptops would be beneficial while fifteen percent said they would not be beneficial.

Overall, students were negative regarding the transition to laptop computers and away from fixed units. On the other hand, eighty-five

percent of the students reported laptops would be beneficial to them. Thus, the university should develop a procedure to provide students with a laptop in a manner that is acceptable to the students and to the university.

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U.S. AND MEXICAN SMALL BUSINESSES: A STUDY AND COMPARISON

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ABSTRACT

Small businesses in Mexico face many of the same problems that U.S. small businesses confront. However, striking differences exist as well. In order to increase small business involvement in international trade between the two countries, it is imperative to understand the similarities, differences, and the commitments needed from each. A study of 120 small businesses, conducted in the industrial state of Jalisco, Mexico, explored four critical areas important for small business growth. Results show that Mexican small businesses do little strategic planning, marketing research, employee training and development, and financial analysis and planning compared to their U.S. counterparts.

INTRODUCTION

When entrepreneurs grow their businesses, they often collaborate with firms in other countries. This allows them to not only focus on their core competencies but also leverage the core competencies of firms in the foreign market (Shrader, 2001). The United States Department of Commerce projects that thousands of small businesses could export but do not for varied reasons, including size, competitive disadvantage, limited analysis and planning abilities, resource limitations, and lack of knowledge about the target country (Christensen, 1993). Research shows that although the number of markets may be limited for smaller-sized businesses, many could be highly successful in multinational markets (Caloff, 1993).

In recent years, North American Free Trade Agreement (NAFTA) partners have accounted for fully a third of U.S. small

business exports (Aldronas, 2001). Even though NAFTA has brought about many changes in the way of doing business between Mexico and its primary trading partner, the United States (Falbe and Welsh, 1998), the full benefit of this integration has not materialized (Campbell, 1996) in all business sectors. Although this area appears ripe for intense investigation because small businesses account for the majority of new jobs and make-up 97% of all exporters (SBA, 2002), surprisingly little recent research has been conducted to further small business partnerships between the two countries.

The purpose of this research is to identify differences and similarities in the conduct of small businesses in Mexico and the United States, point out the business obstacles that this may cause when partnering, and suggest ways to help facilitate small business trade activity between the parties in the two countries. This article first reviews the current literature in four critical areas for small businesses: (1) strategic analysis and planning, (2) market research, (3) training and development, and (4) financial analysis and planning. It then describes the research conducted among 120 small businesses in the industrialized Mexican State of Jalisco. It compares these findings with U.S. small businesses. Finally, it draws conclusions and suggests guidelines for small business partnering between the two countries.

LITERATURE REVIEW

Strategic Analysis and Planning

Many past studies in international entrepreneurship have centered on large, multinational businesses or corporate entrepreneurship. Practical, competitive, strategic management came to the fore, via Miles and Snow's (1978) strategic archetypes (analyzer, prospector, defender, and reactor) and Michael Porter's work, in the area of competitive advantage and strategies (1980, 1985). Porter provided a means for analyzing a firm's competitive environment and fitting the firm into the framework in order to determine the firm's strengths, weaknesses, opportunities, and threats. Barney's (2002) Resource-Based View proposed that a firm's resources could be bundled in such a way that competitive advantage could be sustained resulting in higher

margins. A more recent model by Olsen, Slater and Hult (2005) shows that the firm's overall business performance depends upon its structure (formalized, decentralized or specialized) and strategic behavior (customer, competitor, innovation or internal/cost orientation) moderated by its businesses strategy (prospector, analyzer, low-cost defender or differentiated defender).

Although aimed primarily at large corporate firms, these theories also apply to small business owners who are aware of the importance of engaging in formal strategic analysis and planning activities (Naidu and Prasad, 1994; Nafziger and Kuratko, 1991; Rue and Ibrahim, 1998). Research shows that entrepreneurs are satisfied with these activities (Robinson and Pearce, 1984) as they build their businesses. Increasingly evidence supports strategic planning as a way for small businesses to become more effective and efficient. Studies by Robinson and Pearce (1984), Lyles and Baird (1993), and Rue and Ibrahim (1998) indicated significant performance differences between sales of planners and non-planners. In the U.S., strategic formulation and implementation, based on competitive research, is the accepted method for small businesses to improve performance including those with international focus (Stewart, 2002). The corporate culture of many small businesses in the U.S. remains that of an entrepreneur looking for new business opportunities and growing the business. Overall, however, relatively little attention has been paid to small business activity and strategies for expanding small businesses to the international level (McDougall and Oviatt, 2000).

Marketing Research

Many small businesses in the U.S. manage marketing activities on limited budgets by producing and analyzing marketing surveys and data internally (McDaniel and Parasumaman, 1995), outsourcing those functions, or not performing them as a necessary business activity. Outsourcing of marketing research activities may stem from a lack of confidence in using internally generated information for long-term planning (Callahan and Cassar, 1995). Research by Weinrauch, Mann, et al (1991) identified four critical marketing areas for small businesses, operating with limited finances: (1) placing advertising, (2) hiring marketing services, (3) market development, and (4) customer credit.

Effectively balancing these critical functions is essential to the health and growth of small businesses.

Because small business owners are profit-focused, they often view marketing research as an unnecessary expense (Boschetto, 2004). In addition, small businesses typically have neither the resources nor the economies of scale to extensively analyze secondary data, design a traditional research plan or collect sufficient primary data. Moreover, hiring the appropriate professional marketing services in and of itself implies some marketing knowledge and skills. Most small businesses have an immense need for information such as competitive offerings, promotional options, potential customers, reactions to new products and product modification, but few traditional research providers target or serve the small business community (Levenburg, 1999). Because traditional marketing research channels remain neither financially viable nor practical for a small business with limited personnel, small business have had to develop less traditional conduits of collecting such information. Via a strong entrepreneurial will, and a sophisticated, transparent, and user-friendly data infrastructure, as well as opportunistic behavior by other businesses, small companies in the U.S. typically conduct marketing research in three ways (1) through personal networking, (2) by employing the services of large companies, and (3) via secondary sources using the Internet and trade sources.

While small businesses conduct formal market research on a limited basis, they do informal research on a continuing basis. Customers provide marketing information that a larger company would either outsource to another department or another company (Levenburg, 1997). Because small businesses tend to be closer to their customers, they can quickly gather market information, synthesize it, and act upon it. Moreover, small businesses rely on personal networks to gather and validate market research. Small businesses achieve success and competitiveness due to a constant flow of valuable market and customer information from multiple network sources including friends and family, customers, employees, other business owners, suppliers, distributors, industry contacts and local government (Frazier and Niehm, 2004; Hartman, Burk, et al 1994). A study by Johnson and Kuehn (1987) found that small business operators spend an average of ten hours per month gathering market information about sales, customers, and products. In

addition, research indicates that successful small businesses "seemed to know when to consult professionals, use friends and family to formulate initial plans, or validate advice through more formal sources." (Frazier and Niehm, 2004).

Large U.S. companies such as FedEx, Visa, UPS, IBM, Intel and PeopleSoft have targeted small businesses and, in essence, have become part of the market research efforts of small businesses via an integrated approach to business, especially in areas like logistics and information technology (Maddox, 2004; Callahan, 2004). By outsourcing these duties to industry giants, small businesses have integrated into the great wealth of data and marketing knowledge created, maintained and marketed by these large multinational companies. Small businesses gather marketing information by buying into the marketing research economies of scale and learning curve of these corporate giants. FedEx's purchase and positioning Kinko's as an outsourcing venue to serve the logistical needs of the many small businesses in the U.S. illustrates this strategy.

The spread of computer and information technology among U.S. businesses since 1990 has enabled connections and communications that were unheard of a decade ago. In 1998, small and medium-sized firms in the U.S. spent one-quarter of all capital expenditures on computer and communications equipment. In 2003, small-to-medium size businesses in the U.S. purchased more than $75 billion in technology (Maddox, 2004). Majority of small business owners, use the internet, have a website, sell through their websites, and purchase goods and services over the net (Dunn and Bradstreet, 2001). A recent study by Forrester Research found that virtually all-small businesses (99 %) have internet access (Weiss, 2004). Over half purchase goods and services via the net and over 40 % sell goods and services over the net. However, the most common use of the internet among these businesses is to conduct market research via information gathering and communication (U.S. Small Business Administration 2003).

An increasingly important and overwhelming task for many entrepreneurs is the use and management of the vast amount of general business, industry-specific, and firm-specific data available at little monetary costs but huge time costs. Entrepreneurs spend over five hours a day consuming information for decision making from various media,

including print, online, radio and TV with the most time being spent on the internet (Maddox, 2004). Because of this Internet access and usage, small businesses in the U.S. have many sources of secondary data available to them at little or no costs. Marketing research using such data as NAICS (North American Industrial Classification System) or census information in the U.S. is easy to use, quick, and free of charge. In addition, many small businesses belong to well-organized associations and trade groups that provide data specifically for their industry at little or no costs. In many ways, marketing research for small firms is limited to the amount of time available to devote to the task.

The choice of a generic marketing strategy (low cost, differentiation or focus) is key to the success of a small firm engaged in international business. Because small firms lack the resource advantages necessary to gain economies of scale the low cost approach often puts them at a decided disadvantage to large companies. Although a small firm may use a differentiation strategy (Walters and Samiee, 1990), it too does not come without some barriers. For example, a small firm may lack the management knowledge skills and commitment to develop and implement such a strategy in the international arena. It may lack access to a highly skilled and creative product development team and may lack the wherewithal to defend the strategy against competition. The focus strategy may be the best option for small international organizations because it entails tailoring the marketing mix to fit a very narrow market segment, a niche. With this strategy the company typically relies upon other parties to conduct their foreign marketing activities (Walters and Samiee, 1990), making partnering a particularly attractive option.

Finally, small manufacturers deal more with international trade than other sectors of small business in the U.S. Mexico is the second largest trading partner after Canada. The most difficult problems these small manufacturers face are finding overseas customers and locating reliable representatives. However, most small manufacturers in the U.S. do little if anything to promote their foreign sales (Breeden, 2004).

Training and Development

Overall, small businesses, in the U.S. and Europe recognize the benefits of employee training and development (Keep and Mayhew, 1988) but lack the resources to pursue them as aggressively as larger

firms. Time, funds, and physical limitations hamper small firms' efforts to improve the quality and performance of personnel (Cannell, 2003). In fact, small businesses typically groom employees for leadership positions via informal mentoring (Breeden, 2003). In addition, workers at small businesses tend to have a little less formal education than those at larger companies, only about half have more than a high school education (SBA, 2002). Some small firms perform the tasks of training and development well, while many others lag in these efforts (Keeble and Walker, 1994). Frequently, the entrepreneur directly manages the human resources of the firm (Hornsby and Kuratko, 1990) and many of those owners and CEOs of small firms view training and development as an expense, rather than an investment (Blackburn and Hankinson, 1989). From a leadership perspective, committed owners seek to develop multi-talented employees who can lead the organization through its stages of evolution (Heneman, 2000).

Team-based issues are of major importance in human resources training and development. The emphasis on building teams, both within and among functional areas of the firm, advances the firm's strategic initiatives (Hutcheson, 2003). Firms use teams to involve employees in participation of planning, quality management, product and process improvement, and a host of other firm initiatives (Prado, 2001). The scope of a team may be limited or it may be very broad, as in the case of self-directed or autonomous work groups (Bounds, Yorks, et al, 1994). Depending upon the size of a small business, a team may consist of the firm or the entire organization (Heneman, 2000). Culturally, U.S. employees tend to be very individualistic in behavior but are not constrained by hierarchy in business. Moreover, U.S. firms operate in a low context and monochromic manner getting straight to the point very quickly, being very explicit about how business should be conducted and how time is allocated (Hofstede, 2001; Cateora and Graham, 2005).

Financial Analysis and Planning

Small business operations in the U.S. rely upon financial analysis and planning and regularly prepare financial statements that help plan business activities (Lindecamp and Rice, 1983). The understanding of cash flow and the availability of financing are important factors in the growth or decline of small firms. Limited financial resources can

severely restrict business activity and expansion (Naidu and Prasad, 1994; Walters and Samiee, 1990). The growth of most small firms is constrained by the lack of availability and use of debt financing; few such firms pursue equity financing (Carpenter and Petersen, 2002). To illustrate this fact, in 1998, over 82% of small business firms used some form of credit. Vehicle loans, credit cards, and credit lines are most often supplied by commercial banks to small businesses (Small Business Administration 2002).

In contrast to large businesses financed via public stock and bond markets in the public domain, small business financing comes primarily through private equity and debt markets. Small businesses are therefore not exposed to financial public scrutiny that larger firms encounter. A study done by Allen Berger of the Federal Reserve Board (1998) found that small businesses are equally financed by debt (50%) and equity (50%). The "principal owner" of the business provided almost a third (31%) of the funding for a small business in the U.S., or almost two-thirds of the equity. Commercial banks supplied almost a fifth (19%) of the total financing, other finance companies provides five percent, and trade credit provided 16%.

Overall, the statistics reveal that the largest sources of financing for small businesses are the principal owner (including owner's equity, loans and credit card debt), commercial banks and trade creditors – together accounting for 70% of total funding. As might be expected, larger small businesses (those with over 20 employees) have lower funding provided by the principal owner and receive more funding from commercial banks and finance companies; and are more highly leveraged. This pattern suggests that in order for small businesses to grow into larger ones, a well-developed commercial bank lending system must be available to entrepreneurs.

METHODOLOGY

Faculty members from a Mexican university and a U.S. university collaborated to conduct this research. Primary data was collected from Mexican small businesses using a survey. The

questionnaire was developed with input faculty members from the area university, the local Chamber of Commerce and the business advisory council for small businesses in Mexico's largest industrialized state of Jalisco. Local business leaders and academics designed it specifically for small businesses in the area. Although this sample represents a limited geographical area, it aptly represents small businesses that would readily partner with organizations in other countries. Jalisco, the most highly technical area of the country and promoted as the Silicon Valley of Mexico, provides access to a large and growing base of small business owners and entrepreneurs. These small businesses represent an appropriate population to sample for small business activity because this area is one of the most robust and innovative areas for Mexican business. A sample of 120 small businesses, chosen from the membership list of the Jalisco Chamber of Commerce, responded to the survey. The businesses represented in the survey are micro businesses with less than 25 employees. The owner and/or CEO of the sample companies answered the survey with help from study facilitators who were trained to administer the questionnaire. Secondary data for the U.S. comparison came from the United States Small Business Administration. The time frames for the data sets are compatible.

Table 1: Survey Questionnaire

1. *What is your firm's level of strategic planning?*
    a. *We set short term goals for less than one year.*
    b. *We set longer term goals for longer than one year.*
    c. *We prepare unwritten strategic plans.*
    d. *We prepare written strategic plans.*
    e. *We prepare moderately sophisticated strategic plans.*
    f. *We prepare sophisticated strategic plans.*
2. *Does your firm research new business opportunities?*
3. *Does your firm conduct competitive research?*
4. *Does your firm conduct marketing research to determine potential customers' needs?*
5. *Does your firm use the internet for marketing research or other purposes?*
6. *Does your firm teach team concepts as a part of Human Resources training and development?*
7. *Which term below best describes your firm's financing and cash flow situation?*
    a. *extensive*
    b. *adequate*
    c. *inadequate*

RESULTS

Most (92%) of the Mexican small businesses surveyed do not formulate business strategies. In addition, 72% do not engage in competitive research to determine their competitor's actions or moves. The majority of those surveyed (69%) do not investigate opportunities abroad or even within their own region. Apparently, most of these small businesses do not look beyond day-to-day operations and are not highly sophisticated in terms of basic strategic analysis and planning. As such, they remain unprepared to effectively interpret the competitive moves by

other firms in the industry. By contrast, most (78%) of the small businesses in the U.S. set formal goals for beyond one year and nearly all (92%) set short term goals of less than one year. Over one half of the U.S. small businesses produce moderately sophisticated (35%) strategic plans or sophisticated plans (25%). Sixty percent (60%) prepare written strategic plans and 40% prepare unwritten strategic plans.

Table 2: Survey Results

Mexico	U.S.
Strategic Analysis and Planning	**Strategic Analysis and Planning**
-92% do not formulate strategies -69% do not search for new business opportunities -72% do not conduct competitive research	-78% set formal goals beyond one year -92% set goals less than one year -60% prepare written strategic plans -40% prepare unwritten strategic plans -35% produce moderately sophisticated strategic plans -25% produce sophisticated strategic plans -searching for new business opportunities and competitive research are inherent to strategic planning process
Marketing	**Marketing**
-94% do not research clients' needs or preferences -95% have not used the internet	-25% support formal market studies -99% use the internet -64% gain marketing information from customers -31% believe market studies give firm an advantage -60% do not conduct formal marketing studies
HR Training and Development	**HR Training and Development**
-68% are unfamiliar with team concepts	-Commonly use teams in small business
Financial Analysis and Planning	**Financial Analysis and Planning**
-78% lack adequate financing and cash flow system	-Universally agreed that adequate financing and cash flow is essential to the success of the small firm

Sources: Mexico data – UAG survey; U.S. data – United States Small Business Administration

Of the Mexican firms surveyed, 93% do not research clients' needs or preferences, and 95% never have navigated the Internet. By contrast, virtually all (99%) of U.S. small businesses use the internet in some capacity and two-thirds (64%) gather market information from their customers. The research suggests that small businesses in the Mexican sample have likely adopted the product orientation in producing goods for market. Rather than carefully examining the target markets' needs when producing goods, these small businesses pay little attention to customer preferences or to the target market's needs. Mexican small businesses apparently focus on production rather than on the target market; they typically manufacture products that are easy to produce and then sell them rather than examining customer needs and focusing efforts on satisfying those needs. Because of the lack of Internet usage, many new market trends and other customer information cannot be captured or acted upon. Precise target marketing and overall market analysis would prove very difficult without Internet access and regular usage. Producers may be differentiating their products, but it is most likely evolutionary rather than intentional and not strategic.

In the Mexican small business sample, 71% of the businesses fail to train their employees even when new technology is acquired. Conceptualization of teamwork is lacking, with 68% of the respondents having no knowledge of how to manage teams. Furthermore, 94% have no training programs for quality production and improvement. While U.S. firms generally understand the relative importance of training, development and teamwork, the responses from the owners/CEOs of the small firms in Mexico suggest that they may not grasp the concept, its importance or may not understand how to employ an effective training and development system. Another possible explanation for the lack of training and development could reside in the fact that the average educational level of the business leaders, in this area, is junior high school.

Over three-fourths of the sample (78%) lacks an adequate system of finance and/or cash flow to run or grow the business. Obtaining credit in Mexico is extremely difficult. According to the Banco Comer, of Guadalajara, Mexico, the banking industry is much less developed than

in the U.S. and less able to meet the needs of small businesses. Interest rates are extremely high, and both general credit and credit card access are severely restricted. In contrast to the relatively easy credit availability in the U.S., Mexican small businesses may not be able to find any credit at all. Few Mexican firms can bridge cash flow shortages with lines of credit or credit cards, and expansion may be extremely difficult with limited funds for capital expenditures.

CONCLUSION AND GUIDELINES

Failure of many U.S. small businesses to engage in international commerce with Mexico may be due to an inability to find a viable small business partner. In studying Mexican companies for partner candidates, U.S. entrepreneurs most likely will encounter businesses possessing little knowledge of strategic management, marketing research, financial analysis and planning, and human resource development. While an anomaly for most U.S. business partners, this difference puts U.S. small businesses in a leadership position to team up with Mexican small businesses in order for businesses in both countries to reach their potential. In general, the U.S. small business will benefit by taking more of a lead role in the aforementioned areas and understand that their Mexican counterpart will likely not be as sophisticated in these areas as other businesses with which they have dealt. The Mexican firms in turn will help U.S. businesses understand Mexican firms, the distribution networks, the market and government regulation. They can also help by lowering operating costs and shorten lead times. Having a basic understanding of these limitations, opportunities and benefits will help both the U.S. and Mexican small businesses collaborate, complement, and compete in the global marketplace. The following provides guidelines for U.S. small businesses that seek to collaborate and partner with Mexican small businesses.

Table 3: Partnership Inputs

	U.S. Partner	Mexican Partner
Strategy Formation & Implementation	• Provide technical ability and know-how on strategic planning • Provide a strategic planning framework • Provide direction in strategic management • Set collaborative goals and objectives	• Provide input into the strategic planning process • Supply lower operating costs • Set collaborative goals and objectives
Marketing Research	• Provide internet based market research • Gather potential customer leads • Provide frameworks for Mexican partners on how to gather and use viable customer and competitor information • Identify business opportunities in the U.S.	• Gather potential customer leads • Serve as representative for the U.S. firm • Gather customer needs and wants • Recognize market trends • Identify business opportunities in Mexico
Training & Development	• Help Mexican partners transition to internet-based business • Educate Mexican	• Provide the time and work environment for training and development

	U.S. Partner	Mexican Partner
	partners on team-building	
Financial Analysis & Planning	• Meet some of the cash flow or capital requirements of the Mexican partner • Build flexibility into payment plans • Provide a common understanding of financial statements and analysis	• Help defray some of the upfront costs of developing and expanding into Mexico

Strategy Formulation and Implementation

A U.S. small business, considering a partnering arrangement with a Mexican firm, should provide direction in strategic management and help educate the Mexican partner in this area in order to enhance their overall competitiveness. Knowing that the Mexican partner will likely have limited ability and accessibility to analyze the competitive environment, U.S. firms should take the lead in determining not only their own strengths, weaknesses, opportunities and threats, but also their Mexican partner's as well. Because planners out perform non-planners, U.S. businesses need to help determine more of the Mexican firm's strategic initiatives and perhaps even help them set goals and objectives. The global competitive advantage for a small business is its ability to be flexible with specific know-how. As such, information technology will play a key role in determining what to produce, when to ship and how to adapt the product. U.S. firms should aid Mexican partners by providing technical ability and know-how, and overall strategic initiative. The U.S. and Mexican firms should determine and then use the core competencies of each firm.

Marketing Research

Because of the differences in the marketing infrastructure between the U.S. and Mexico, U.S. businesses who want to partner with small Mexican businesses will need to play a stronger role in marketing research and strategic marketing. The ubiquitously accessible Internet with its linkages to industrial and governmental data provides U.S. companies with an opportunity to help direct the marketing mix of the Mexican firm. Just as large U.S. companies such as FedEx, UPS and IBM have positioned to be outsourcing marketing partners of U.S. firms, because of their superior technical and research capabilities, small U.S. firms can play a larger role in the market outsourcing of their Mexican partners. Instead of a reactive product position, U.S. firms need to proactively engage Mexican firms to produce and market those goods that the end market most desires. Moreover, because of better research capabilities, U.S. companies can better pinpoint target markets that Mexican firms cannot locate and serve because of their limited communication technology. U.S. firms should provide internet-based market research for their Mexican partners.

U.S. firms can aid small Mexican firms via more advanced product differentiation strategies. Mexican small firms probably pursue a low-cost generic marketing strategy because of the low relative cost of labor – a strategy most likely pursued by default rather than by design. This type of strategy puts small producers at a disadvantage because larger firms enjoy an economy of scale that small firms cannot match. U.S. firms can help small Mexican firms become "customized producers," (that is; a focus strategy) a niche that small businesses are particularly well suited because of the smaller production runs. Such customization however requires a more intimate understanding of the target market, a service that U.S. firms can more easily provide via their advanced technological capabilities. However, the Mexican firm can be active in helping serve a narrow market segment by providing first-hand knowledge about markets in Mexico.

Research shows that three of the biggest export barriers that small firms face include limited information to locate/analyze markets, inability to contact overseas customers and difficulty identifying foreign business opportunities (Leonidou, 2004). With close working relationships and market training, U.S. and Mexican firms can help each

other alleviate these export barriers. Although U.S. firms may need to provide guidelines on how to gather and use customer information, Mexican firms should provide information on local markets and help identify business opportunities and profitable market segments. Likewise, U.S. firms should provide their Mexican partners information on potential customers in the U.S. In addition, The U.S. company can outline a simple framework for gathering and using market and customer information that both partners can access. Finally, because U.S. firms are probably more familiar with using big business servicing firms like FedEx, IBM and PeopleSoft, they can help Mexican firms navigate the appropriate use of such service providers as well as functioning as this type of service. Finally, a niche marketing strategy is probably best for small manufacturers in Mexico because they cannot compete with the economies of scale. A niche market requires a close relationship with the customer and also a flexibility that can change in an instant. For this, the Mexican producer will have to remain flexible and the U.S. partner will have to remain close to the customer.

Because most small businesses in Mexico do not currently navigate the World Wide Web, buying and selling goods via the Internet with U.S. partners is not an existing option. Currently, Mexico ranks thirty-ninth out of the 60 biggest economies in the world, just behind Poland, Argentina and Brazil, in terms of how amenable it is to internet-based opportunities (The Economist 2004). U.S. firms can move up the value chain to help market and provide services for their Mexican partner's products by providing such services as strategic market planning, market data and analysis, and consumer research. As the technical infrastructure develops in Mexico, these U.S. businesses will be well positioned to guide their Mexican partners towards the best market opportunities. U.S. firms should help their Mexican partners ready themselves for internet usage.

Training and Development

Mexican small businesses likely will not have an active training and development plans for their employees which follow Human Resources Development principles. This limitation could undermine the introduction of new processes and technologies and make the partnership less effective, efficient and adaptable to change. U.S. businesses can

help their Mexican partners by providing assistance in establishing and nurturing an effective training and development plan in concert with strategic initiatives. Such a plan should be basic and uncomplicated, keeping in mind the business and cultural environment differences between the U.S. and Mexico. Although U.S. firms are familiar with change management, Mexican firms may not understand the complexities of change associated with growth. Therefore, introductory-level organizational development can provide a basis for aligning the firms' processes with objectives of growth, efficiency, and improvements in quality management. U.S. firms should help their Mexican partners in providing basic training and development including mentoring Mexican partners both formally and informally. With any training and development, the differences in culture will need to be considered and understood. While Mexico and the U.S. have many similarities, understanding that the U.S. is low context whereas Mexico is high context will aid communications within the training and development.

The U.S. partners will be very explicit in what they say whereas in Mexico the meaning will be deciphered in the context in which it was said. In addition, Mexican business people will be very interested in building and enhancing the relationship before business whereas the U.S. firm will be more about getting down to business. Finally, U.S. business people will not appreciate the hierarchical nature of the Mexican business environment whereas the Mexican partner will not fully appreciate the individualistic nature of their U.S. counterpart.

Financial Analysis and Planning

Financial constraints could undermine the U.S.-Mexican business relationship and prevent the partner arrangement from growing. Mexican small businesses are at a decided disadvantage in terms of finding viable, affordable credit. Bank loans to small businesses in Mexico remain costly and arduous. Banks provide secured loans for up to half the property's value at over twice the rate (16% for five years) that U.S. small businesses typically can obtain (Banamex.com). In addition, only about one third of the households have a bank account (Easton 2005) and lending by commercial banks to businesses and individuals is just over 10% of GDP in Mexico (Lyons and Barkley 2006).

When a U.S. partner requests increased production because of burgeoning demand or new clients, the Mexican partner will likely find it difficult to expand quickly because affordable financing is likely unavailable. The banking system of Mexico does not meet the credit needs of small businesses in the same way that U.S. banks cater to small business needs. In addition, rudimentary understanding of cash flows, income statements and accounting methods are likely sparse as Mexican small businesses operate in more of a "cash economy". U.S. business should be prepared to meet the financial requirements of their Mexican partners to allow them to expand production or at other critical times. In addition, the U.S. firm should take the lead to provide a common understanding of financing terms and income statements and financial analysis. Finally, the U.S. partner should build in some flexibility in payment plans knowing well that the Mexican partner does not have a banking partner in the same way that the U.S. firm has that provides essential business credit and other financial needs.

In conclusion, opportunities for small businesses in Mexico and the U.S. to partner abound. This paper exposed striking differences in the way small businesses in the two countries operate and in the environment in which they do business. In particular, this study examined four critical areas in which Mexican small businesses differ markedly from U.S. small businesses: strategic analysis and planning, market research, training and development and financial planning and analysis. Once identified, this paper discussed how these differences can be acted upon and used in Mexican-U.S. small business partnering strategy. In general, the findings suggest that the U.S. firms take a leadership role in the partnership because of the more sophisticated business environment and small business know-how in the U.S., but that each partner focus on its core competencies and leverage the core competencies of its foreign partner in order to better complement and compete in the global marketplace.

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