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## **An Integrated Approach to the Teaching of Operations Management in a Business School**

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## VIEWPOINT

# An integrated approach to the teaching of operations management in a business school

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### ABSTRACT

The authors discuss a curriculum integration effort that a school of business piloted recently. This effort was aimed at integrating the core functions (finance, marketing, management, and operations) so that undergraduate students would better appreciate the full impact of functional decisions on each other and in achieving the corporation's business objectives. The authors deployed a webbed integration model in which a business case was used to highlight the impact of a functional decision on the other three functions. The focus of the article is on how this model was implemented in the context of a required introductory course in operations management. The authors also discuss the results of this effort, lessons learned, and the path forward.

### KEYWORDS

business curriculum; business functions; integration; operations

## Introduction

Traditionally, the undergraduate business school curriculum has included basic core courses in four functional areas—management, finance (and accounting), marketing (and sales), and operations. Students enroll in these courses in any order and frequently, the professors of one functional area do not know the contents of the other functional areas. The argument for having an integrated curriculum is based on the integrated nature of decision making in a corporation where the impact of a decision must be understood on achieving the business objectives as well as the consequences for all functional areas. In the absence of this, functional areas can make decisions that could optimize their own objectives but not meet the objectives of the company.

This motivated our school of business (SBUS) to come up with a plan for achieving this integration within our core undergraduate business administration curriculum. A curriculum subcommittee, consisting of senior professors from each discipline, was formed to define the contents of the four courses. A major instrument used to achieve this integration consisted of an in-house developed case on Microsoft's relaunch of the Surface tablet (Microsoft Corporation, Redmond, WA).

The focus of this article is on describing how this integration was achieved within the teaching of the core operations management course. The rest of this article is

organized as follows: the second section contains a review of the previous work reported in the literature related to integration; the third section describes the integration model; the fourth section discusses the implementation plan; the fifth section describes the assessment plan; finally, the sixth section contains the summary and conclusion.

## Review of the previous research

Over the years, several scholarly work have been published dealing with modifying the content of operations management (Bahl, 1989; Raiszadeh & Ettkin, 1989) to make it more relevant to students. LaForge and McNichols (1989) analyzed the integration of operations management and information technology. Julien, Doutriaux, and Couillard (1998) discussed the need of integrating logistics into the teaching of operations management. Walters (1999) discussed the integration of marketing and operations management. Boykin and Martz (2004) reported the use of an enterprise resource planning (ERP) system to teach functional interrelationships in a business. McKone and Bozewicz (2003) reported the use of simulation of a service organization to demonstrate integration concepts. Cannon, Klein, Koste, and Magal (2004) reported use of team teaching, student group projects, multidisciplinary cases, and, the

use of ERP systems to achieve a higher degree of integration. Temponi, Bryant, and Fernandez (2009) reported the results of integrating business functions into an ERP system. Pasin and Giroux (2011) discussed the use of simulation in the classroom to achieve integration. Most recently, McCord, Houseworth, and Michaelsen (2015) reported another approach to integration—integrative business experience (IBE)—whose theme is real decisions and real consequences create real learning.

One of the earliest reported efforts aimed at integrating the entire business curriculum was at the University of Idaho (Morris, 1997). The first semester of the two-semester integrated program focused on giving students the big picture of the business and the second semester focused on day-to-day business decision making from the time of customer order until the order is fulfilled. An integrated business case was used to highlight the integrations issues. Pal and Busing (2008) reported the results of an integrated curriculum at James Madison University. This program consisted of one integrated semester that covered the material from the four business functions (management, finance, marketing, and operations). The course started with the process to develop a business plan for a business venture and then covered all business functions in a logical sequence as dictated by the business needs.

The SBUS integrated business curriculum was heavily influenced by the programs at Idaho and James Madison. It consists of an integrated semester consisting of the four discipline specific courses, with each course devoting about 20% of the course material to deal with integration issues. To facilitate this integration, a business case on Microsoft's Surface was developed.

### **Purpose of the SBUS integration exercise**

The purpose of the integrated semester during which students take all four core courses—operations, marketing, finance, and management—is to highlight a basic fact of business life: big decisions have ramifications across functional boundaries. A finance decision to reduce working capital levels would limit how much inventory manufacturing might hold and thus constrain its production planning. An operations decision to switch from a process-oriented to a product-oriented layout would require that marketing be able to drive demands to the high levels needed to make this a reasonable decision. Switching to a product-oriented layout would also have important implications for how workers are paid and incentivized—a human resources decision. Marketing decisions such as pricing and promotions impact profitability (a finance concern) and production planning (an operations concern). Thus while these

courses are taught in stand-alone fashion, students must understand that in real life, the effects of decisions are felt across the enterprise. Furthermore, successful implementation of such decisions requires the active cooperation of all stakeholders. Without this cooperation implementation will be incomplete and the full benefits of a decision will not be realized.

We do not try to teach marketing or finance or management in operations classes or vice versa as it is not practically possible. In this sense our model emulates real life. Businesses have functional divisions that are responsible for functional decisions. Major functional decisions have repercussions on other functions. This has to be recognized and managed to ensure successful outcomes for the company as a whole.

### **Selection of integration model**

The integration implementation plan for our integrated curriculum was highly influenced by the curriculum integration models (Fogarty, 1991) discussed in the literature. The first three models (fragmented model, connected model, and nested model) are mainly designed for achieving integration within each discipline. The next five models (sequenced model, shared model, webbed model, threaded model, and integrated model) are aimed at achieving integration across disciplines and the last two models (immersed model and the networked model) are designed for achieving integration at both within and across disciplines. Of the 10 models, three seemed to fit the needs of an integrative approach at this school. A sequenced model would allow the presentation of topics in a linear fashion from product design and manufacturing to warehousing and distribution, to post-sales support. A webbed approach would help students see the concepts as they relate to a business issue. A weighted table (see Table 1) of integration model criteria by integration model was created. A Delphi-type decision process was used among the course designers and faculty to select the criteria, their respective weights of importance in the selection process, and the actual scoring.

We selected the webbed model of integration. It was a better fit to our requirements, especially in terms of content compatibility where there are identifiable themes that can be learned from the combined perspectives of operations, finance, management, and marketing.

### **Implementation plan**

The operations course would try to highlight the links with other disciplines as discipline-specific concepts

**Table 1.** Weighted comparison of integration models.

Item	Criterion Importance	Sequential model		Webbed model		Fragmented model	
		Fit	Product	Fit	Product	Fit	Product
Degree of integration	5	4	20	4	20	1	5
Teachability	5	4	20	5	25	3	15
Availability of instructional materials	4	3	12	4	16	4	16
Instructor comfort level	3	3	9	3	9	5	15
Content compatibility	3	4	12	5	15	3	9
Logistical alignment	3	3	9	5	15	4	12
Total			82		90		72

were discussed. The main components of this approach were as follows:

- *Base case*: The base case would be used to get students to become familiar with Microsoft and its industry, its products and its markets, its competitors.
- *Operations case*: This smaller case was focused on a major operations issue. Resolving this operations issue had repercussions across the other disciplines.
- *Teaching notes*: The teaching notes identified the approach to take with the issues raised in the Microsoft cases and appropriate points where links with other disciplines could be stressed.
- *Project/presentation*: A group effort at identifying an integrated solution to the problem presented in the function-specific cases
- *Learning goals assessment*.

### Execution of the implementation plan

All instructors used the same textbook and covered mostly the same chapters, in approximately the same sequence. They all discussed the Microsoft cases in their classes and used the teaching notes for guidance. They all allocated about 20% of the grade to integration-related assignments. Full-time instructors taught six sections of the course each semester; adjuncts taught the remaining four sections. Full-time instructors were able to consult each other and fine-tune their integration efforts. This kind of collaboration was limited with adjuncts because of schedule differences.

The Microsoft case was interwoven with the subject material for the class as follows.

#### Weeks 1–10

All sections of operations management introduced the Microsoft base case early in the semester. Early chapters in operations discuss mission, vision, core competence, competitive strategy, and operations strategy. Homework assignments served as an excellent vehicle to get students

to read the case and connect these different ideas. Examples of these assignment are the following:

- What is Microsoft's objective for the entertainment and devices segment?
- How does Microsoft compete—on price, or differentiation, or responsiveness?
- What is the role of operations management in the Surface tablet?

Next instructors introduced the functional case at this stage. We summarize the operations case as the following:

The initial launch of Surface did not go well for Microsoft. Public acceptance of the product at a higher-than-premium price was low and Microsoft took a \$900 million charge on unsold inventory. However Microsoft was going to persist with the tablet and launch Surface 2 at a lower price. To offset the financial losses of the first launch Microsoft decided not to compromise on its profit margins. Surface 2 would have a lower price but its production cost would have to be 10% lower. Possible solutions are (i) renegotiate costs with current manufacturer Pegatron, (ii) switch from Pegatron to a new manufacturer, and (iii) negotiate a lower transfer price with the Windows division. What should Microsoft do?

As the course progressed the case was also used to explore function-specific issues. For example, forecasting, product design, process selection, quality management, project management, inventory management, facility location, and supply chain management are all standard topics in this class. Some examples are the following:

*Forecasting*: Where is Surface 2 in the product-life cycle? What difficulties does this pose for forecasting demand for it? (Highlight: Connection with Marketing and its role in driving demand; How are forecasts used by the other functions?)

*Product design*: Exactly what functionality did the VaporMag case offer other than aesthetics? Was it worth the material-related difficulties in production that Microsoft faced? (Highlight: Which functions might have had input to this design?)

*Quality management:* Microsoft has to reduce Surface 2's cost by 10%. Create a cause-effect diagram to identify all possible ways (within reason) to achieve this. (Highlight: Cost can be reduced through cheaper materials. Who in Microsoft might object to this? Why?)

*Supply chain management:* Identify the supply chain for each of the main components in Surface 2. Go as far back up the chain as you can. Where possible identify names of potential suppliers (they may not be the ones Microsoft actually uses). (Highlight: Why would Finance want to be involved in supplier selection and negotiations?)

## Weeks 11–14

While the exact implementation of discussing integration issues varied depending on instructor and size of class, most classes used some form of team-based role-playing to understand and convey their understanding of the integration concept while coming up with a proposal to achieve the 10% reduction of production cost?

Students were divided into three sets of groups.

- *Proposer groups* represented the operations function and proposed a solution to the problem in a detailed memo clearly identifying their preferred solution and its justification. The other groups had to develop a critique of it.
- *Rejoinder groups* represented marketing, finance, and management functions. They had to prepare a written critique of the approach recommended by the proposers from their functional perspective.
- *Evaluator group:* This group acted as an impartial judge and evaluated proposals and rejoinders and wrote a memo describing their own recommendations.
- *Final examination:* The final examination consisted of one question aimed at testing the student's general awareness of integration concepts. A sample question from a recent exam is shown in Appendix A.

## Assessment: Process and results

### Assessment process

The success of this integration effort must be measured against the learning goals articulated for this effort. SBUS has adopted the following learning goal for this integrative approach:

Our students will be knowledgeable about the basic concepts in the major business disciplines and the integration among them.

Thus with respect to operations management, this goal is looking for two outcomes—(a) knowledge of operations management and (b) knowledge of the

integration of operations management with finance, marketing, and management.

Feedback on the extent of success achieved with respect to integration was obtained in multiple ways:

- *The Integration Project:* The key components were the memos and the presentations. They were graded according to a rubric that was shared with the students.
- *Assessment of learning:* As part of the Assessment of Learning program at SBUS, students answered a question on their final exam that tested them on the basic concepts of integration.
- *Student feedback:* Also, students completed a survey reflecting on both what and how they learned through this approach. The scope of this survey (Appendix B) was the entire integrated curriculum and not just the operations class. Students were asked about the concept of integration and the way the concept was executed in the key elements: the integrated core, the Microsoft case, and the project.

### Assessment results

- *The Integration Project:* Proposals, responses, and recommendations were often a simplistic restatement of facts and arguments made in the case. Overall, most groups performed well (median grade: 18 of 20) and seemed to have grasped the underlying concepts of integration.
- *Assessment of learning:* Students performed well on the assessment question on their final exam. The average score was 8.5 of 10.

### Student feedback

Students' numerical assessments and comments on the survey were consistent in that most students saw value in the concept of integration. A significant percentage of our students work either part-time or full-time and understand the need for business functions to work together.

When asked about the execution of the integration concept it was obvious that they were unhappy. Most students did not like the Microsoft case. They thought it was outdated in terms of the central issues with which it dealt. They did not think that the projects added much value. Students felt they were doing the same project in four different classes and saw it as busy work. In terms of workload the feedback was that it was too high—they were covering all the material in a normal course in addition to the integration components.

There were some complaints from working students about the difficulties of scheduling classes and trying to arrange group meetings for four classes.

	Management		
Operations Topics	Marketing	Finance	Management
<b>Operations Strategy</b>	Pricing, quality, customization, service levels	Revenues, costs, inventories, working capital requirements	Staffing, skills, incentives, organization
<b>Forecasting</b>	Demand assessment, timing, promotions, inventory location, build-up and draw-down	Cash-flows, budgeting and working capital requirements,	Staffing, hiring, layoff, training
<b>Design of Goods and Services</b>	Demand, quality, price, market-share, service levels, selling strategies	Costs, revenues, working capital, supplier selection	Staffing, training, supervision
<b>Managing Quality</b>	Price, demand, customer reactions, quality perception, buying decision-making, selling strategies	Costs, budgeting and investments, return-on-quality, warranties	Staffing, training, supervision, organizing for quality (eg quality circles)
<b>Process Strategy</b>	Price, quality, variety, customization, lead times	Investment, budgeting, return on assets, profitability assessments, vendor selection	Staffing levels, skills needed, hiring, layoff, training, organization, incentives, productivity measurement, supervision
<b>Location Strategy</b>	Pricing, quality, lead-times, inventory positioning, selling strategies	Investment, budgeting, profitability assessments, costs, taxes, exchange rates	Staffing, skills, training, labor laws, union issues, cultural issues, political issues, sustainability
<b>Job Design, and Work Measurement</b>			Staffing, skills, incentives, organization, supervision
<b>Supply Chain Management</b>	Demand assessment, timing, promotions, inventory location, build-up and draw-down	Cost assessments of buy versus make, outsourcing, allocation of costs, budgeting, supply chain costs, inventory, profitability,	Transparency and communication in the chain;
<b>Inventory Management</b>	Matching demand and supply, timing of promotions and sales, inventory location, build-up and draw-down, service levels, trunk stock	Cost of goods sold, inventory turnover, working capital, carrying costs, vendor selection, inventory auditing, inventory write-offs	Training.
<b>Project Management</b>	Timing of promotions and sales	Project finance and rates of return	Staffing, skills, incentives, organization, supervision

Figure 1. Integration questions across disciplines.

The bulk of the criticism was aimed at the faculty. Students did not feel that the faculty had made enough effort to coordinate the material across the four courses; the courses were offered as they would normally have been offered with the project and the case added on. Faculty did not use the case effectively enough. In some classes the case was mentioned only toward the end of the semester. Many students felt that the faculty were inadequately prepared to deal with the topic of integration.

In summary, overall, students saw the value of the integration concept, and would not have minded the inconveniences and the scheduling issues of the integrated core if they thought it delivered value. Unfortunately it did not and that made the extra work and the projects seem pointless.

From all of these results we reasoned that three items needed to change:

- Faculty needed clear direction in terms of what integrative aspects to emphasize. They themselves needed to fully understand how operations integrates with the other disciplines.
- Student comments indicated that the Microsoft case was dated. Also, faculty did not have a coordinated approach to deal with this issue.
- Integrative activity should be spread more uniformly over the semester rather than be concentrated into an end-of-semester project in each of the four integrative core classes that the student takes.

### Going forward

Based on all the feedback, it was decided that we would continue with the integration effort but with some changes. The changes are as follows:

- The case format will be discontinued. Instead, Whole Foods Market Inc. will be studied in depth from an operational perspective using publicly available material.
- A matrix (Figure 1) has been created that shows the interplay between operations topics and the other disciplines. This matrix will be used by all operations instructors to guide their integration discussions as various operations topics are discussed. This matrix will be used by the other functions to develop similar matrixes identifying cross-functional impact from their point of view.

1. Each student will write a term paper on integrating the roles of the different functions at Whole Foods Market Inc.
2. There will be sharing of evaluation material between operations management and the other

disciplines to understand other disciplines' particular approaches to integration.

3. Over the semester, effort will be made to bring in speakers from Whole Foods Market Inc. who will be able to give students special insight into particular operational issues.

### Summary and conclusions

We have discussed the effort that the SBUS put in integrating the core functions so that students will better understand the full impact of decisions made by the four functions on achieving the business objectives of a corporation. The focus of this paper is on the activities taken up to integrate the operations course. Students were required to take all four courses in the same semester. We deployed a webbed integration model in which a business case (Microsoft) was used to highlight the impact of a functional decision on other three functions. This case was developed in-house by the faculty from all core disciplines. In operations course, we also used the case to connect the various operations topics to practice.

These efforts have had mixed results. Even though we achieved a noteworthy higher level of integration knowledge overall, students thought the faculty was not well coordinated in delivering the material. They also thought that the Microsoft case did not bring out all integration related issues. Some of them complained about the scheduling inflexibility of having to take all four courses in the same semester. The majority of our students work to pay for the school. The integrated semester created problems in their work schedule. Also, as instructors spent uneven time in discussing the case and failed to relate with other disciplines, students saw little need for the integrated semester.

Learning from students' feedback, we have made quite a few changes for the coming academic year. We are abandoning the case concept and focusing on studying a company in depth from different functional perspectives while stressing the linkages. It will allow a much better execution of the webbed integration model that we believe is still the best model for our course.

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### Appendix A: Integration question on final exam

For each of these issues, assess the impact on the other functions as *high*, *moderate*, *low*, or *none*. Give a supporting argument.

#	Operations issue	Impact on			Reason rated high or moderate
		MKT	FIN	MGT	
1	Microsoft have noticed warping of the screen in a number of tablets.	H	H	L	MKT: Quality of screens will mean complaints, returns and replacements, unhappy customers, bad publicity, loss of sales and share FIN: Cost to fix problems will increase COGS. Bad publicity might impact share prices
2	A fire at a factory has caused Pegatron to shift production to a plant in Mexico.				
3	OM Mangers have proposed steps to reduce inventory by reducing service levels.				
4	Microsoft operations managers have suggested changes to the material of which the VaporMag case is made.				
5	Operations is planning to slash production by 10%.				

### Appendix B: Student survey questions (agree/disagree and comments)

1. Elements of Business course prepared me pretty well for the material in the integrated semester.
2. The reasons for taking the four courses during the same semester made clear to me.
3. I see no advantage to taking the four courses in the same semester.
4. The Microsoft case was useful in helping me to see how each functional area of business operate in the real world.
5. In each of the four “300” series courses, the other functional areas and their impact on one another were discussed.
6. If an employee asked me to give an example of the major functional areas of business working and interacting together, I could easily do that as a result of my learning in the integrated semester.
7. I was better able to understand the discipline concepts because a single business problem (Microsoft) was used across the four courses.
8. In at least one of my courses we spent the last week or so discussing how the four functional areas work together.
9. On a percentage-of-course basis, how much of the total course time was focused on the Microsoft Case?



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