

JetFighter: An Experiential Value Chain Exercise

Norman T. Sheehan*

Edwards School of Business
University of Saskatchewan
25 Campus Drive
Saskatoon, SK S7N 5A7
Canada

+1 306 966 4801

+1 306 966 2514

Sheehan@Edwards.usask.ca

Edward N. Gamble

School of Business
University of Prince Edward Island
550 University Ave
Charlottetown, PEI C1A 4P3
Canada

+1 902 620 5144

egamble@upei.ca

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* Corresponding author

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Abstract

Value chain analysis is widely taught in business schools and applied by practitioners to improve business performance. Despite its ubiquity, many students struggle to understand and apply value chain concepts in practice. JetFighter uses a complex manufacturing process (making intricate paper planes) to provide students an opportunity to enhance their value chain competencies. Teams of students are asked to use value chain concepts to develop innovative business strategies that will enable them to fulfill customer requirements and outperform rival teams. The exercise involves two production periods with a brief value chain lecture occurring after the first production period. Given that teams of students typically lose money in the first production period, their motivation to learn about the value chain concepts is enhanced as they are immediately provided an opportunity to apply this knowledge in the second production period. The award-winning exercise was developed over a nine year period with the help of undergraduate and masters' students. Student feedback suggests that they found the exercise an engaging and enlightening way to learn about value chain analysis as 99% of students (n=244) recommend that instructors at other universities use the exercise.

Key words: value chain analysis; internal analysis; strategy formulation; cost chain; activity-based costing; experiential exercise

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Introduction

The value chain is a conceptual framework used by managers and consultants to analyze firm performance. Porter (1985, 1991, 1994, 1996, 1998) proposes that the key to improving business performance is to understand how customer value is created. The value chain is a generic activity template which practitioners apply to divide the firm into the individual activities it undertakes to create value for its customers. Porter (1985) argues that it is only by using the value chain to break the firm into the activities it performs, such as manufacturing, logistics, hiring, training, purchasing, and marketing, that it is possible to rigorously analyze where the firm may decrease its costs and/or increase its customers' willingness to buy.

First introduced by Porter in his 1985 book, *Competitive Advantage*, the value chain is widely taught to business students, applied by practitioners, and cited by academics. Value chain analysis is widely employed in business schools, especially in the areas of strategic management (cf., Barney and Hesterly, 2008; Dess, Lumpkin and Eisner, 2007; Ghemawat, 2008; Hitt, Ireland and Hoskisson, 2009; Johnson, Scholes and Whittington, 2007; Lynch, 2005; Marcus, 2005; Saloner, Shepard and Podolny, 2005; Thompson, Strickland and Gamble, 2007; Walker, 2006; Wheelen and Hunger, 2007) and management accounting (cf., Anthony and Govindarajan, 2007; Atkinson, et al., 2007; Blocher, et al., 2008; Horngren, et al., 2007; Shank, 2006). Even though it is almost 25 years old, the value chain concept is still widely used by managers and consultants in a variety of functional areas and industries. A search of the term "value chain" in the "citation and document text" of practitioner articles located in the ABI/Inform Global database results in 10,300 hits.¹ If we narrow the search to just the "abstract" text of the same practitioner articles, it results in

¹ Accessed 18 October 2008—searched for term, "value chain" in "citation and document text" of practitioner articles, which was calculated by subtracting the total number of hits less the number of hits for scholarly articles.

1548 hits,² the majority of which (1204) occurred since the turn of century (January 2000 to October 2008). These “abstract” hits occur in diverse management fields, such as strategic management, management accounting, entrepreneurship, information systems, operations and production management, logistics, marketing, economic development, and health care administration. Concepts from the value chain are also widely applied in academic research as evidenced by the fact that Porter’s 1985 book is the second most frequently cited work in the *Strategic Management Journal* during the period 1987-2000 (Ramos-Rodriguez and Ruiz-Navarro, 2004).

We developed this exercise because many students find the value chain concept difficult to grasp, and even more students struggle when asked to undertake value chain analysis. We found that the best way to reinforce the value chain concept is to provide students with an opportunity to use it in an experiential exercise. The context for the JetFighter exercise is a complex manufacturing process (making intricate paper planes), which employs each of the value chain’s support and primary activities (see Figure 1 in Appendix C). For example, deciding how to organize production is an important Firm Infrastructure activity. Selecting and training individuals to perform one or more of the production steps is a Human Resource Management activity. The process of improving their team’s folding techniques is a Technology Development activity, while deciding how many raw materials (plane templates) to buy is a key Procurement activity. Performing each of the folds required to manufacture the plane are the Operation activities, while Outbound Logistics involves placing the finished planes in the showroom. Finally, teams prepare marketing pitches which is a Marketing and Sales activity, and some teams offer warranty plans, which is an After-Sales Service activity.

² Accessed 18 October 2008—searched for term, “value chain” in “abstract” of practitioner articles, which was calculated by subtracting the total number of hits less the number of hits for scholarly articles.

JetFighter is an adaptation of Osland, Kolb, Rubin and Turner's (2007) Starship Enterprise exercise. It uses the same plane template (the raw material), plane folding instructions, and purchasing criteria as the Starship Enterprise exercise. However, while both experiential exercises use the same materials, their learning objectives are different. Osland, Kolb, Rubin and Turner (2007) use Starship Enterprise to reinforce key change management principles, while JetFighter asks students to employ concepts from value chain analysis to develop profitable business strategies. Student feedback suggests that they find the exercise an engaging and enlightening way to learn about value chain analysis.

Implementation Guidance and Learning Objectives

We recommend that rather than lecturing on the value chain and its application, it is more beneficial to assign one or more of the following readings³ prior to class and then review the basics of value chain analysis after completion of the first production period. As most, if not all, teams perform poorly in the first production period, reviewing value chain analysis prior to its application in the second production period heightens the students' motivation to learn these concepts as they can immediately apply them in the second production period. The exercise can be run in a minimum of 80 minutes (see page 6 for an overview of the minimum times for each step), but it is strongly recommended that instructors use 120 minutes or more (see page 6 for an overview of the recommended times for each step).

The learning objectives of this exercise are:

³ In addition to chapters in the strategic management and management accounting textbooks listed above, instructors can assign one or more of these value chain readings: Ghemawat and Rivkin (2006) "Creating Competitive Advantage"; Porter (1998) Chapter 2, "The Value Chain and Competitive Advantage", Chapter 3, "Cost Advantage", and Chapter 4, "Differentiation" in *Competitive Advantage*; Shank (2006) "A note on value chain analysis" in *Cases in Cost Management: A Strategic Emphasis*; CMA Canada's (1999) Management Accounting Guideline, "Value Chain Analysis for Assessing Competitive Advantage."

- To develop students' ability to formulate innovative tactics to reduce cost and increase revenue using value chain analysis,
- To understand the pros and cons of value chain analysis, and
- To appreciate when it is appropriate to use value chain analysis.

Given JetFighter involves a high level of student interaction, it is also suitable as an ice-breaker activity.

Instructor Preparation

The learning effects are enhanced if students practice making the planes prior to the exercise. Therefore, distribute the directions on how to assemble the JetFighter paper planes and two practice planes to each student at least one class prior to running the exercise (see Appendix A for the JetFighter Folding Instructions which include the Government Purchase Criteria, and a facsimile of the paper plane template, which is also referred to as the raw material in the text. The paper template and JetFighter Folding Instructions used in the exercise are available from <http://jme.sagepub.com/supplemental/>). Inform students that in connection with learning about value chain analysis there will be a paper plane making competition next class, so that it would be beneficial to practice making planes that meet all Government Purchase Criteria prior to coming to next class (at this point refer students to the last page of the JetFighter Folding Instructions which lists the six purchasing criteria). State that although the raw materials may contain flaws, it is possible to make planes that conform to the Government Purchase Criteria. If the instructor has run the exercise before, keep one plane that has passed inspection and show it to students at this point. If this is the instructor's first time running the exercise, then s/he can make a plane themselves to show to the class. A second option is to wait until the class where the exercise is run as some, if not all, students will bring their practice planes to show their group members. Select a practice plane that would pass inspection, ask the student for permission to show it to the rest of the class, and then

pass this plane around to the other groups. In order to reduce confusion between practice and real production planes, it is recommended that that instructors copy the practice planes using a different color. The exercise involves nine steps (the minimum and recommended times for each step are listed in brackets):

1. Review Learning Objectives and Steps (5-10 min)
2. First Team Planning Session (10-15 min)
 - a. Instructor Sells Raw Materials to teams near the end of the First Team Planning Session
3. First Production Period (5 min)
4. Inspection of Planes and Calculation of Profit/Loss for Each Team (5-10 min)
5. Review of Value Chain Analysis (20-40 min)
6. Second Team Planning Session (15-30 min)
 - a. Instructor Sells Raw Materials to teams near the end of the Second Team Planning Session
7. Second Production Period (5 min)
8. Inspection of Planes and Calculation of Profit/Loss for Each Team (5-10 min)
9. Debrief (10-20 min)

The exercise involves teams competing to maximize their profitability so instructors need to break their class into teams. The best results are achieved with at least three student teams as it increases the competitive dynamics and variety of potential strategies. Given that larger teams better simulate the challenge of managing complex manufacturing operations, it is recommended that instructors form teams of 6-12 students (e.g., with a class of 18, have three teams of six students; with a class of 40, have four teams of ten students; with a class of 60 have five teams of 12 students). With four or more teams the inspection periods take longer than the recommended

allotted time, so if an instructor has more than four teams it is recommended to allow for more time for inspection or to have a second instructor help inspect the planes. If the instructor has teams with less than five individuals, it is recommended to provide an additional five minutes of production time in both production periods.

Once the instructor has formed teams, each team is assigned a plane type to manufacture: “Basic Training Plane” or “Deluxe Combat Plane.” If there are an uneven number of teams, then the extra team should be assigned to produce Basic Planes. Note to instructor—the raw materials are identical for both plane types so they will need to use three different paper colors when copying the paper plane template: Practice planes are one color (make two for each student and hand these out in the class prior to running the exercise); Basic planes are a second color (make 50-60 planes for each Basic team); and Deluxe planes are a third color (make 40-50 planes for each Deluxe team).

The raw materials cost for each plane type varies with the amounts purchased (see Table 1 in Appendix A for the Instructor’s Copy of the Raw Material Cost for each plane type). The amount earned for each Deluxe plane that pass inspection is \$10 million, while the amount earned for each Basic Plane that pass inspection is \$5 million. Given that the revenue earned for each Deluxe Plane is double that of the Basic Plane, and its margins are nearly double that of the Basic Plane, to ensure that teams have an equal opportunity to succeed, instructors must hold the Deluxe Planes to a higher quality standard. Instructors can accomplish this by applying the Government Inspection Criteria more stringently to the Deluxe Planes in two ways: Firstly, to pass inspection each Deluxe Plane must meet all of the Government Purchasing Criteria to the letter. For example, the wing tips should be exactly 1 inch high and straight up. All folds are crisp and on the lines, etc. Secondly, each Deluxe Plane must, to a high degree, look like the other Deluxe Planes. For example, each cabin must be puffed out exactly the same on all Deluxe Planes, the width of each wing must be the same for all Deluxe Planes, the wing decks level, etc. On the other hand, the standards for passing Basic

Planes should be lower. For example, the Basic Plane's wing tips do not need to be exactly 1 inch. There may be some folds on the Basic Plane that are not on the lines or crisp. The wing decks of Basic Planes can be approximately level and the planes may only resemble one another to a lesser degree.

There are four appendices attached, organized as to when instructors will require the materials contained therein. Appendix A contains materials needed the class prior to running the exercise (The JetFighter Folding Instructions, which include the Government Purchase Criteria and a link to the JetFighter Folding Instructions file; A facsimile of the Plane template and a link to the plane template file; and Table 1 – Price and Raw Material Cost by Plane Type. Note Table 1 is intended for instructors only). Appendix B contains hand-outs needed at the start of the exercise (“Hand-out to each member of the team building the Basic Plane” and a link to the file; “Hand-out to each member of the team building the Deluxe Plane” and a link to this file). Appendix C contains Tables and Figures to be used during the exercise (Figure 1 – Value Chain, Figure 2 – Drivers in Graphical Format, Table 2 – Profit and Loss Spreadsheet, and Table 3 – Porter's Activity Drivers Applied to JetFighter). Appendix D contains the student feedback questionnaire.

Running the JetFighter Exercise

Step 1 – Review Learning Objectives and Steps (5-10 min)

Start the class by reviewing the exercise's learning objectives (see above), and then outline the exercise's context, the nine steps (see above), and the Government Purchase Criteria with students:

Context: Your team is the senior management group of the small and financially challenged JetFighter Company. Your company has just won an important Government jet fighter contract that needs to be fulfilled immediately. In order to win the contract, your firm agreed to produce at least five planes in each period. A Government Purchasing

Agent (played by the instructor) will buy all planes that *exactly* meet the Government Purchase Criteria, which are listed on the last page of the JetFighter Folding Instructions. Note that planes that do not pass inspection or are not completed in the first five minute production period cannot be re-used in the second five minute production period as they become obsolete. The goal of the exercise is to earn the most profit, where profit is calculated as the difference between the revenue earned from the planes that pass inspection and the cost of all raw materials. There may be small problems with the quality of the raw materials, but there are no refunds.

Explain that the Government needs two types of planes built: Deluxe Combat Planes are required for military situations requiring heavy combat, while Basic Training Planes are required for training as well as peacekeeping missions. Take a minute to reinforce the importance of meeting each of the criteria by reviewing them:

1. Printed lines should be in the position shown on the diagram.
2. The wing tips must be turned up 1 inch on each wing and be straight up on both sides.
3. The “pilot’s cabin” (step 11b) must be puffed out considerably. Skinny cabins crowd the fighter pilots. The cabin folds must be creased on the printed lines. The centre cabin line must line up with the nose tip.
4. The two wings must be level and even with each other (i.e., the entire wing deck should be at the same level). The printed lines on the wings must meet in the centre at a 45° angle.
5. The plane’s nose tip should be pointed at a 45° angle.
6. The planes should be able to fly.

At this point, some students may note that the raw materials (paper templates) are not perfect, however, this adds to reality and complexity of the simulation as materials provided by suppliers are not always perfect. Instructors may reinforce that there are no refunds and that students need to

work around any quality issues, assuring them that it is possible to make planes that surpass the Government Inspection Criteria.

Inform students that the Government Purchasing Agent will purchase all Deluxe Combat Planes that pass the Government Inspection Criteria for \$10 million, and all Basic Training Planes that pass the Government Inspection Criteria for \$5 million. Given the plane template and Government Inspection Criteria are the same for both plane types, instructors should explain that given the price of the Deluxe Combat Plane is double the Basic Training plane, that the quality of the Deluxe Combat planes must be superior to that of the Basic Training Planes. To make the point, use an automotive example. Tell students that the quality of the Deluxe Planes should be similar to the quality of Lexus cars, while the quality of the Basic Planes should be similar to KIA cars. KIA cars are less expensive than Lexus Cars, and thus KIA buyers anticipate that KIA's quality standards are correspondingly lower than Lexus' quality standards.

At this point, instructors can choose to provide more information regarding how they will apply the Government Purchasing Criteria when inspecting the planes. For example, they can state that if Deluxe Planes are to pass inspection all wing tips must be exactly 1 inch high and all wing decks must be level, etc., while noting that Basic Planes will be held to a lower standard. Alternatively, instructors may choose not provide any additional information regarding the inspection criteria, other than to share the automotive example described above, leaving it up to the teams to approach the Government Purchasing Agent to enquire as to his/her purchasing standards. Saying little about how the purchasing criteria will be applied at this time provides an opportunity for the instructor to reinforce that succeeding with a differentiation strategy requires knowing who the customer is and what s/he is willing to pay for.

Assign each team a plane type to manufacture (Deluxe or Basic) and then hand out the sheets which outline raw material cost to the appropriate team (see Appendix B for "Hand-out to

each member of the team building the Basic Plane” and “Hand-out to each member of the team building the Deluxe Plane.” Copies of both files are available from <http://jme.sagepub.com/supplemental/>). As the instructor is handing out these sheets, remind the teams that the raw material cost information for each plane type is proprietary and should not be shared with other teams.

Conclude this step by informing the teams they have fifteen minutes to formulate their strategy and decide how to best organize in order to execute their strategy. Remind them, that by the end of the planning session, they will need to inform the instructor how many raw materials templates they will purchase. Lastly, remind students while the Government Purchasing Agent will purchase all planes that pass inspection, they have a contractual obligation to attempt to build a minimum of five planes.

Step 2 – First Team Planning Session (10-15 min)

Provide teams with 10-15 minutes to formulate a strategy to maximize their profitability. To make students aware of the importance of each plane passing inspection, the instructor may ask students to calculate a break-even point for each production amount under consideration. If the instructor has not done so already, this is an opportune time to prepare the Excel spreadsheet to calculate the profit or losses for each team. This spreadsheet will be used at the end of the first production period (see Table 2 in Appendix C). When three minutes remain in the Team Planning Session, the instructor should approach each team to remind them they need to decide on how many planes they will produce in the first production period. As will be discussed in Step 5 (Review of Value Chain Analysis), the decision about how many planes to produce is a function of procurement, a support activity in the value chain.

Step 2a – Instructor Sells Raw Materials

In Step 2a, the instructor, in the role of the Raw Materials Supplier, approaches each team to find out how many raw material templates they will purchase. The instructor then counts out the raw materials (plane templates). If the instructor wishes, s/he can short the number of raw materials delivered to one or more of the teams (i.e., deliberately “miscount” the number of plane templates so the team receives one less than ordered. When discovered, the instructor has the option of providing the additional sheet or charging the team only for the number of sheets actually received). This provides the instructor an opportunity to reinforce the importance of inbound logistics activity in Step 5 (Review of Value Chain Analysis).

Step 3 – First Production Period (5 min)

If each team has more than five students, then teams are given **five minutes** to produce the planes. If each team has less than five students, provide them ten minutes to produce the planes. There is a flurry of activity as students struggle to fold the raw materials into planes which meet all Government Inspection Criteria. Instructors will observe many different production strategies, of which the most common involve using an assembly line or a job shop. The choice appears to be based on whether there are individuals in the group who are competent folders. If there are one or more competent folders, the group will try organizing as individual job shops. In order to signify the importance of the outbound logistics activity, tell students that the Government Purchasing Agent will only buy planes that are in the “showroom,” so they need to place the planes in a separate “showroom” prior to the expiration of the five minutes. As a way of further increasing the energy in the room, the instructor may play “Danger Zone” by Kenny Loggins which is the theme song from the movie “Top Gun.”

Step 4 – Inspection of Planes and Calculation of Profit/Loss for Each Team (5-10 min)

After the allotted production time is completed, the instructor, acting in the role of the Government Purchasing Agent, begins his/her inspection of the planes. In some cases, students may try to market their planes. Encourage this activity as increasing product demand is an integral part of the marketing and sales activity. From experience, students are more receptive to learn about value chain analysis if they feel their team's planes have been fairly accepted/rejected. In order to increase the equity and transparency of the inspection process, quickly survey all of that team's planes, looking for one that best meets the Government Purchase Criteria. Bear in mind that Deluxe Planes should have consistently higher quality than Basic Planes. After selecting the plane that best meets the six criteria, compare this plane to the others, rejecting all that are not as good as the best one. While rejecting planes, make it clear to students why they are being rejected using the Government Purchase Criteria as a basis.

After the inspection is completed, calculate and display the profit earned (lost) by each team on an overhead (see Table 2 in Appendix C). On average, teams will attempt to produce 10-30 planes in the first production period, however, only 40-60% of these will pass inspection. The high rejection rate reflects the difficulty making consistently high quality planes using a job shop (i.e., one student performs all of the 18 folds required to make a plane) or inexperience with efficiently running an assembly line (where a student performs 2-3 folds for each plane). Given this, teams almost always lose money, and team losses exceeding \$100 million are not uncommon in the first production period. Teams with large losses may be discouraged, so at this point, indicate to the class that the first round will not count towards the final result. Rather, announce it was merely a way to practice the requisite competencies needed to succeed in the second production period.

Given their lack of success in running a production company, students should be motivated to learn how to improve their team's performance using concepts from value chain analysis.

Step 5 – Review of Value Chain Analysis (20-40 min)

Use this opportunity to outline how to perform value chain analysis by reviewing each step:

1. *Use the value chain to break-down the firm into its key value creating activities.* Place a blank value chain on a slide and ask students to allocate their team's activities to each of the value chain activities (see Figure 1 in Appendix C). Begin with the primary activity, Inbound Logistics. Students should understand that that inbound logistical activity involves ensuring they have received the right amount of raw materials (the paper plane templates). Continue to Operations, which includes the folds the students complete to manufacture the plane. Outbound Logistics involves placing the completed planes into a separate showroom area. Explain that Marketing & Sales are activities, such as advertising, that the firm undertakes to stimulate demand for the firm's offering. In this case, it is the sales pitch delivered by students during the inspection period. After-Sales Service is providing repair and maintenance services to customers. Pause here to describe how Rolls-Royce changed its business model from being a jet engine manufacturer to a total solutions provider. Under its old business model, Rolls-Royce earned most of revenues from the sale of jet engines, however, it now earns the majority of its revenues from servicing jet engines. Rolls-Royce installed monitors in each of the 3,500 jet engines it sold which continually assess the performance of the engine. Rolls-Royce anticipates problems and then performs repairs which increase the availability of planes. Even though Rolls-Royce may sell jet engines at a loss, the change from a jet engine manufacturer to total solutions provider has proved

profitable for Rolls-Royce as its margin on after-sales service is estimated to be as high as 35%.

Move on to support activities, noting that these activities aid the company in performing its primary activities. Firm Infrastructure involves deciding which strategy to implement as well as, choices regarding production, marketing and advertising. Human Resources Management is selecting, training, retaining the right employees. In this case, it means choosing which team members will perform which value chain activity, and training these individuals accordingly. Technology Development involves developing new offerings and/or new processes that increase the buyer's willingness to buy or decrease the cost of the current offering. In this case, it may include improving folding techniques by using rulers, and scissors. Lastly, Procurement involves negotiating the purchase of the materials needed for production. In this exercise, the critical procurement activity is deciding how many planes to buy.

2. *Analyze the individual activities looking for ways to reduce cost and increase revenue relative to competitors.* Begin by asking students what is effectiveness in the context of the exercise. Students should understand that the buyer is looking for planes that meet all Government Inspection Criteria. Place them in the buyer's shoes and ask if there is anything else they can do to increase the buyer's willingness to buy. Enquire if the buyer is looking for anything else? Students may struggle, so ask them to consider the buyer consumption chain; that is all the activities the buyer undertakes from performing research about which product to purchase, to purchase negotiations with the vendor, to its usage, its maintenance, and finally disposal of the product. Ask students for examples of what their teams can do to make it easier/more attractive for the Government Purchasing Agent to buy, use, and

dispose of their planes. One example is to improve the quality of the paper folds (a technology development activity as it improves the process).

Now ask students what efficiency means in the context of this exercise. Students should understand it means reducing the average production time per plane, as being able to produce more planes decreases the input price for each raw material template purchased. Ask how they can reduce cost while holding quality constant. If they struggle, show students a BIC pen, and ask how does BIC ensure its pens are produced at low cost with the same quality. From this example, students should come with the idea to use an assembly line. Ask why an assembly line is the best approach. Students should understand that assembly lines allow companies to produce large quantities of like quality products. This provides the instructor with a segue to discuss how activity drivers impact cost and revenues.

3. *Analyze the cost and differentiation drivers for each activity.* Begin by explaining that cost drivers influence the time, amount of materials used, and quality produced in each activity. Differentiation drivers increase the likelihood the buyer will buy the product. There are ten potential drivers that may impact cost and revenue, so remind students to use Pareto's Law to look for 20% of the drivers that explain 80% of the improvement in cost or willingness to buy. As some students are visual learners, instructors may want to display graphs to help illustrate how the drivers, scale, learning, capacity utilization, and linkages impact cost (see Figure 2 in Appendix C). As the instructor reviews each of the drivers, s/he can share the following examples to reinforce their use in practice. Begin by noting economies of scale are commonly used as a basis to justify mergers between firms. For example, a larger scale provides bargaining power that firms may use to force their suppliers to lower their prices or force their buyers to accept higher prices. As one of the world's largest retailers, Wal-Mart is an example of a firm that aggressively uses its scale to force its suppliers to lower prices.

Learning effects are enhanced by training employees to increase their speed and proficiency, as well as initiatives to transfer best practices between divisions. Capacity utilization is important for companies with large fixed costs. Instructors can use the example of higher end restaurants (such as Ruth's Chris Steakhouse, a high end steak restaurant in the USA) which have started to cater afternoon office parties as examples of firms who are trying to enhance their profitability by increasing the capacity utilization of their key assets. A large American supermarket chain, Meijer, hired Accenture's Operations Workforce Optimization unit to improve the throughput of its cashiers, which in turn will lower its labor costs as it needs to schedule fewer cashiers for each shift. Using time and motion studies, Meijer has set standard times based on the type of goods purchased and customers' ages. Cashiers are timed on how long it takes them to cash out customer purchases and poor performers are counseled on ways to improve. Linkages between buyer and supplier value chain activities help to reduce cost or improve revenue. An example is Zara, a chain of clothing stores which is currently a leader in the fast-fashion industry in Europe. Zara produces the majority of its high fashion goods in Spain, Portugal and Morocco, rather than lower cost countries in South East Asia. It trades off higher production costs (workers in Spain average \$1650/month versus \$200/month in China) with lower transportation costs and the ability to change its clothing assortment faster than rivals. Costco has worked with suppliers to change the shape of packaging in order increase the number of products that can be loaded on a pallet. Suppliers enjoy reduced transportation costs (presumably some of which are passed on to Costco in the form of lower input prices) and Costco has reduced the number of pallets needed by 200,000 a year.

Ask students for suggestions of how these drivers may help their team improve the efficiency and effectiveness of its JetFighter activities (see Table 3 in Appendix C). From

the above discussion, students should understand that scale, learning, linkages, and capacity utilization are key drivers. Scale is important in this exercise as purchasing more raw material plane templates reduces the unit cost of each. Learning is critical as the more an individual performs one type of fold, the more proficient they become in terms of speed and quality. Linkages are key as errors early in the folding process cannot be corrected by quality control at the end of the production line. Capacity utilization is important as the key resource is human capacity. If students are waiting idly at the end of the line, then the team is not using its human resources efficiently. Drive home the point that the key to successfully managing cost in an assembly line is to maintain a constant flow of materials through the factory.

At this point, review the Porter's other six drivers in the context of the exercise (see Table 3 in Appendix C). Begin with the driver, interrelationships, asking if there are ways they can share activities with other divisions. Instructors can note that General Mills, a \$14 billion producer of consumer products, such as Cheerios and Hamburger Helper, saved \$12 million a year by combining its purchases of oils, sugar and flour across several divisions. Ask if they can improve their results by exploiting the integration driver by outsourcing certain value chain activities. Note that outsourcing non-core activities was a popular strategic tactic in the 1990s with larger corporations, such as British Petroleum, which outsourced its finance function to Accenture, a consulting firm. Ask if there are policy choices student can make to help increase the buyer's willingness to accept the planes or decrease cost. Instructors can use General Mills as an example. By cutting the number of pretzel shapes in Chex Mix from 14 to 3, they saved \$1 million per year. Reviewing these drivers helps raise ideas that the students may employ to improve their results in the second production period.

4. *Use Value Chain Analysis to develop a strategy to maximize the bottom line by finding ways to increase revenue and decrease cost.* As teams are competing, students will be reluctant to share their ideas, so at this point send the teams away for the second team planning session. Before sending the students away, announce that teams have the option to change the type of plane they manufacture in the second production period from Deluxe to Basic or vice versa. The only caveat is that teams commit to the change before they are allowed to see the other plane type's proprietary cost information. Lastly, challenge the teams to use value chain analysis to come up with tactics to increase revenues or reduce cost. To encourage innovative thinking, tell students to improve as many of the value chain dimensions as possible, noting that anything not explicitly forbidden in the rules may be negotiated. Clearly reinforce that any side deals between the Government Purchasing Agent, the Raw Materials Supplier (both played by the instructor) and the teams must be in writing and signed by all parties to be valid. After sending the teams away, take a minute at this point to place all finished and unfinished planes from the first production period in a paper recycling bin to avoid these being re-used (illegally) in the second production period.

Step 6 – Second Team Planning Session (15-30 min)

During the planning period, students will typically develop novel tactics to improve their team's profitability. The tactics are listed from most to least used by students:

- Divide the folding activities into simple steps and then practice these during the planning period.
- Reorganize the assembly line to increase capacity utilization by having workers at the end of the production line help out with the first four folds and vice versa.

- Improve quality by training staff or using advanced production techniques, such as rulers to help fold, or scissors to trim sheets.
- Decorate the planes in order to increase purchase agent's willingness to buy.
- Approach the Government Purchasing Agent to clarify how she/he will apply the Government Purchasing Criteria in the second plane inspection period. Some teams may show the Government Purchasing Agent (played by the instructor) examples of planes and ask if these planes would pass inspection. As this is part of getting customer feedback, instructors should provide fair feedback, noting problem areas and successes.
- Prepare marketing campaigns to help brand and sell their planes during the inspection period. Examples include making advertising posters and placing these on the walls of the "showroom," and then greeting the Government Purchasing Agent with a handshake and a brief sales pitch that clearly outlines the benefits of their team's planes.
- Merge or share buying with another team to increase the amount of raw materials purchased which reduces unit cost. An advanced variation of this tactic is for two or more merged teams to use their enhanced bargaining power to negotiate prices which are lower than those given on the "Cost for Raw Materials" sheet. Based on the validity of the arguments made by the merged teams for why they should receive a rebate, instructors can decide how much of a rebate s/he will offer the merged team (i.e., a rebate of \$100,000 off the posted cost).
- Offer after-sales services for a fee to the Government Purchasing Agent, such as maintenance agreements, a 24 hour help centre, and warranties as a way of increasing their revenue. Depending on the quality of the after-sales service package offered and arguments made by the teams, the Government Purchasing Agent (as played by the instructor) may agree to pay \$100,000 to \$200,000 extra for each plane passing inspection for after-sales services.

- Sell any rejected planes to the Government Purchasing Agent as replacement parts or scrap at the price negotiated and recorded in a signed contract. The price paid for rejected planes which are to be used for scrap/parts is typically a nominal sum such as \$200,000 per plane.
- Offer to pay an additional fee to the supplier in order to get materials delivered to the team as needed during the production period (i.e., instead of ordering all raw materials in advance). If approached asking for just-in-time supplies, the Raw Materials Supplier (as played by the instructor) can demand an additional \$200,000 per plane above what is shown as the raw material cost on the “Cost of Raw Materials” (e.g., if the team wants a just-in-time supply of raw materials and ultimately produces 16 basic planes, they would pay \$4.1 million per plane instead of the posted cost of \$3.9 million).
- Negotiate extra time (e.g., 2 minutes) where the team attempts to repair any planes that did not pass inspection. The Government Purchasing Agent then inspects these again and buys those passing the second inspection at a lower, negotiated price, typically at a price not greater than the raw material cost.
- The Deluxe Team sells its rejected planes to a Basic Team at a purchase price negotiated between the two teams and recorded in a signed agreement. The two teams arrange to have the Deluxe planes inspected first, which the inspector should agree to. The Basic team then takes the Deluxe planes that do not pass inspection and places these planes in their Basic Plane showroom and the Government Purchasing Agent inspects these using the same criteria as used with the other Basic Planes.

One team’s entrepreneurial response to the raw material quality was to offer to build low, low cost JetFighter planes using lined paper from their note pad. They successfully negotiated a purchase cost for each sheet of lined paper and a price for each that passed inspection with the instructor. All of their planes subsequently passed inspection as it was difficult for the instructor to

reject any planes as there were fewer and less rigorous Government Inspection Criteria to apply (i.e., there were no lines or stars to line up). This team won, which provides an important lesson in strategy to the class: If a firm does not like the way the game was played, they should work to change the rules of the game in their favor.

It is important to provide students enough time to allow their ideas to fully develop and then get agreement within their team and with other teams. As part of their team's strategy, many teams will propose deals with other teams or with the Government Purchasing Agent/Raw Materials Supplier (both played by the instructor). Encourage the students to participate in deal making, but to be fair to other teams ensure that the instructor, in the role as the Raw Material Supplier and Government Purchasing Agent, receives full value in exchange for any concessions. For example, rather than purchasing all raw materials upfront, teams may ask for just-in-time deliveries at no cost. State the supplier is open to delivering on a just-in-time basis, but ask students to propose a fair level of compensation for providing just-in-time delivery, such as paying an additional \$200,000 per plane. The actual amount agreed to will depend on the ability of the team's negotiator. Remind students that in order to avoid the potential for after the fact disagreements, state the instructor will not honor verbal agreements. Rather, insist that any side deals between the Government Purchasing Agent and/or Raw Materials Supplier (both played by the instructor) and teams, or between teams, be in writing and signed by both parties.

If it is a shorter class period, break the class at this point to allow students time to formulate their strategies prior to the next class. If it is a longer class period, plan a 15-20 minute break as students become very engaged and typically use the majority of the break time and the planning time allocated for the second planning period to negotiate deals with the Government Purchasing Agent/Raw Materials Supplier and other teams, as well as practice and train team members to make more and better planes. When three minutes remain, the instructor should approach each team to

remind them they need to decide on how many planes they will produce in the second production period. Also remind students at this time that any side deals need to be signed by all parties and delivered to the instructor before the start of the second production period if they are to be included in the second period profit calculation.

Step 6a – Instructor Sells Raw Materials

At the end of Second Team Planning Session, the instructor delivers the raw materials ordered for the second production period to each team.

Step 7 – Second Production Period (5 min)

If each team has more than five students, then teams are given **five minutes** to produce the planes. If each team has less than five students, provide ten minutes to produce the planes. There is a flurry of activity as students struggle to finish their planes on time. At this point, the majority of teams will use two (or more) assembly lines, with some workers moving around to enhance their utilization. In order to signify the importance of the outbound logistics activity, remind students that the Government Purchasing Agent will only buy planes that are in the “showroom,” so they need to place the planes in a separate “showroom” area prior to the expiration of the five minutes.

Step 8 – Inspection of Planes and Calculation of Profit/Loss for Each Team (5-10 min)

After the allotted production time is completed, the Government Purchasing Agent begins his/her inspection of the planes. Repeat the same inspection procedure employed in the first production period. During this time, there will be extensive sales and marketing activities by students taking place, such as displaying advertising posters, delivering sales pitches, and attempting to make the Purchasing Agent comfortable by playing music and offering them beverages. There is significant

energy generated by students eager to show off the results of their strategies. Start the process by picking the team's best plane, and have the team agree it is the best, bearing in mind that the quality standards for Deluxe planes are correspondingly higher than for Basic Planes. Then compare it to all other planes in the showroom, only accepting those which are exactly the same as the best plane. If students have understood and put into practice the relevant value chain analysis concepts, 80-95% of their planes should pass inspection. Given the higher production quality and the tactics outlined above, many, if not all, teams should show a profit. After the inspection is completed, calculate and display the profit (loss) for each team (see Table 2). Declare the team with the largest profit as the winner.

Step 9 – Debrief (10-20 min)

Place the following questions on a slide and lead a plenary discussion starting with the first question:

1. *Why did the winning team win?* The winning team uses concepts from value chain analysis to place the largest wedge between revenue and cost. Display the value chain framework on a slide asking the class how they used value chain analysis to improve their performance from the first round to the second round. If members of the winning team have not already contributed to the discussion, invite their members to share the tactics they used to increase revenue or decrease cost. To conclude, review the contents of each deal, emphasizing how these deals exploited one or more of the concepts from value chain analysis. For example, a deal between two teams to share purchasing activities exploits the scale driver as it lowers the unit cost for both parties. As one 2006 Masters' student commented, "The first period was about building the most planes. The second period was about making deals and strategy."

2. *What were the key success factors?* Student comments should focus on those factors which decreased unit production times, or enhanced quality which improved the Government Purchasing Agent's willingness to buy, such as scale, capacity utilization, and policy choices relating to marketing, strategy tactics, etc.
3. *What are the pros and cons of using value chain analysis?*

Pros

- It is a powerful tool, which provides guidance on how to improve a firm's revenue and cost, and
- It is easy to implement strategic changes once identified as the analysis has been on what firms do—its activities.

Cons

- Value chain analysis is a data intensive process and it may be difficult to obtain the necessary data,
- It is a complicated and time-consuming process, especially at the level of activity drivers, and
- The value chain template works best with manufacturing firms (i.e., firms that create value by transforming raw inputs into finished outputs). Value chain analysis is not applicable for firms that primarily create value by facilitating connections between customers, (i.e., network firms such as Fedex or Sprint Nextel), or firms that primarily create value by solving problems through the application of expertise in real-time (i.e., knowledge-intensive firms such as McKinsey) (Author, 2005).

In the past nine years, two instructors have successfully run the exercise with eight classes of undergraduate strategy and entrepreneurship students, and fifteen classes of strategy and management accounting students in Master's of Business Administration, Master of Professional Accounting, and Master of Science programs. One indicator of the exercise's efficacy is that the results in the second production period are consistently higher than those achieved in the first production round (even after taking into account the learning effects with respect to folding). In addition, as we do not provide any other guidance to the teams other than to encourage teams to be innovative and to state that all agreements between the teams and/or the instructor must be in writing, the quality of the side deals signed by students prior to the second round also indicates a high level of proficiency with respect to using the concepts from value chain analysis to generate new tactics. The authors also tracked the exercise's efficacy with graduate and undergraduate students.

The first author has collected two types of feedback from graduate students in Europe and North America. The exercise was used in one section of masters' students at a European Business School. After completing the exercise, the students (n=65) were asked to complete a Student Questionnaire (see Appendix D). The average age was 24.8 years, with 3.8 years of university. The students reacted very favorably to the exercise with 100% (n=51) of students recommending that instructors at other universities use this exercise. The most common comment from students (29 responses) was that it was useful to understand value chain analysis and fun to complete. Students were also asked, "How much did the exercise help you understand how to perform value chain analysis?" where 1 was unhelpful and 10 was helpful. The exercise received a rating of 7.9 (n=56). Students found the exercise interesting as it received a rating of 8.2 (n=66), where 1 is boring and 10 is interesting. As a control measure, students were asked if they had done the assigned readings

(85% of 55 reported they had read the readings) and if they had been previously exposed to value chain analysis (38% of 56 reported they had been previously exposed).

The first author has also used the exercise with Masters' students in North America. A Student Questionnaire was administered to two sections of graduate students (n=67). The average age was 24.2 years, with 4.9 years of university. The students reacted very favorably to the exercise with 98% (n=45) of students recommending that instructors at other universities use this exercise. Representative written student comments included, "The exercise put you in a position to make strategic decisions," "It was extremely fun and engaging. Helped illustrate basic VC concepts well." "Educational and fun. Informative example of relating to a real-world application of the VC." "It was a fun exercise that clearly demonstrated the concept," "It was interesting, drove the point home on value chains and I enjoyed the competitive aspect of the exercise," and "It is a good way to build the team dynamic and really gets the students thinking." Students were also asked, "How much did the exercise help you understand how to perform value chain analysis?" where 1 was unhelpful and 10 was helpful. The exercise received a rating of 7.8 (n=46). Students found the exercise interesting as it received a rating of 9.1 (n=46), where 1 is boring and 10 is interesting. As a control measure, students were asked if they had done the assigned readings (80% of 46 reported they had read the readings) and if they had been previously exposed to value chain analysis (57% of 46 reported they had been previously exposed).

Prior to using the Student Questionnaire, the first author tracked the success of the exercise in eight sections of graduate accounting students using the following survey question: "Please rate the following in-class activities. Circling a 1 indicates you learned nothing from the activity. Circling a 10 indicates you feel you have an excellent understanding of the concepts employed in the activity: *JetFighter* Exercise (Using paper plane assembly to help understand value chain analysis)." The exercise averaged 8.1 (n=257) on a 10 point scale where a 1 indicates students have

learned nothing from the exercise and a 10 indicates that students felt they had an excellent understanding of the concepts employed in the activity.

The second author administered the same Student Questionnaire to five sections of senior undergraduate students taking strategy and entrepreneurship courses. The average age was 22.4 years, with 3.2 years of university. Students reacted very favorably to the exercise with 99% (n=148) of students recommending that instructors at other universities use this exercise. Written student comments included, “It is a practical exercise that puts one in a real world environment.”, “It was a fun way to understand how each part of the value chain adds value.”, and “Forces students to differentiate their product and to add value to the end user.” Students were also asked, “How much did the exercise help you understand how to perform value chain analysis?” where 1 was unhelpful and 10 was helpful. The exercise received a rating of 8.3 (n=148). Students found the exercise interesting as it received a rating of 9.0 (n=148), where 1 is boring and 10 is interesting. As a control measure, students were asked if they had done the assigned readings (33% of 148 reported they had read the readings) and if they had been previously exposed to value chain analysis (45% of 148 reported they had been previously exposed).

Both instructors look forward to running the exercise every term as it creates a virtuous learning circle: The high level of student engagement as measured by the discussion in the room and the hallway after class, leads to a high level of student learning as indicated by the feedback above. Based on these results, the exercise has been adopted in a recent version of CMA (Certified Management Accountant) Canada’s professional program, The Strategic Leadership Program, as a pedagogical tool to illustrate value chain analysis.

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Appendix A
Materials Needed Prior to Running the Exercise

Table 1: Price and cost for raw materials for the Deluxe and Basic Planes (For Instructors Only)

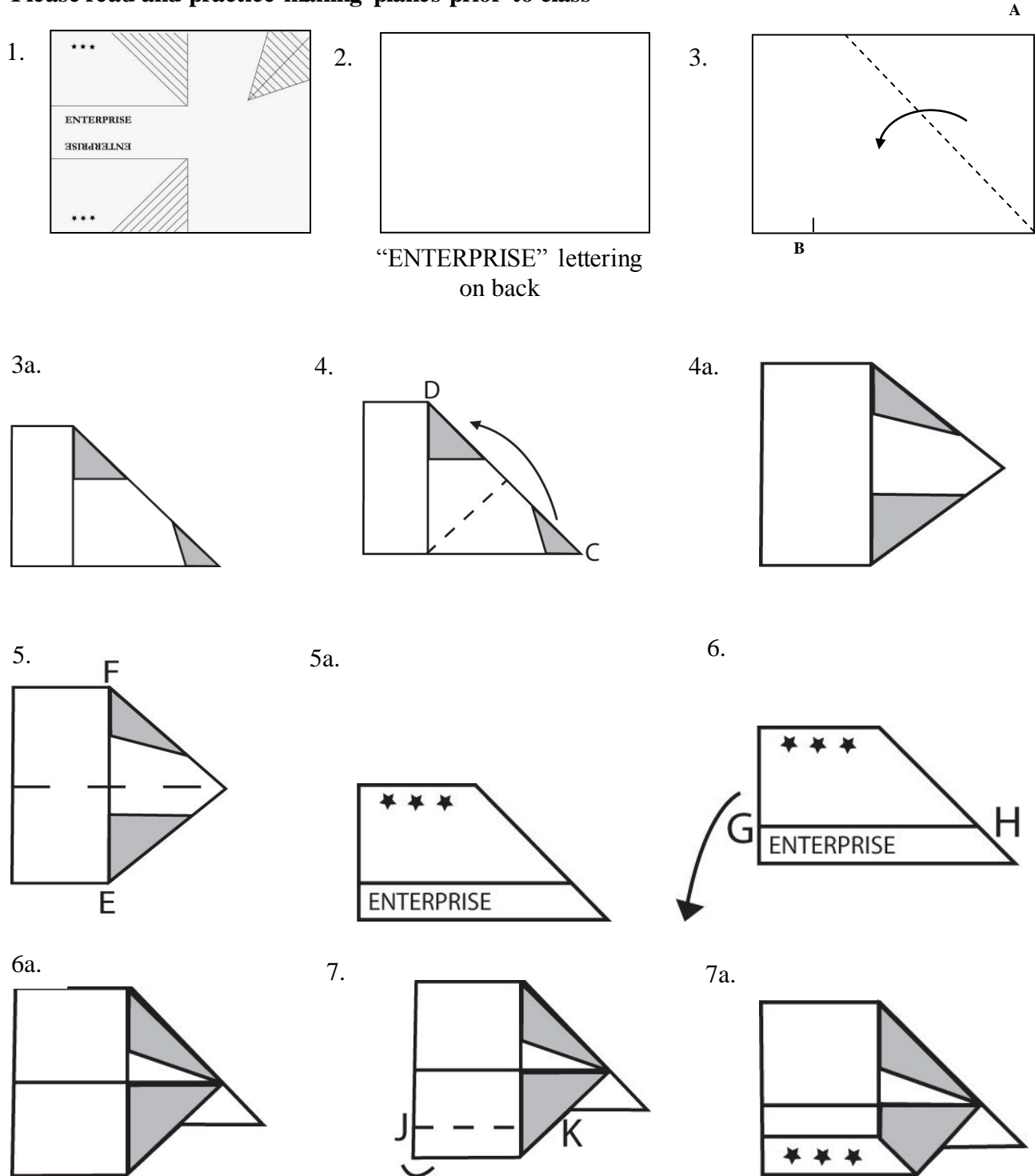
	Raw Materials Purchased	JetFighter Plane Type	
		Deluxe (\$ millions)	Basic (\$ millions)
Price Paid *		10.00	5.00
Cost per Raw Materials	5 (min order size)	8.50	4.40
	6-10	8.30	4.20
	11-15	8.10	4.00
	16-20	8.00	3.90
	21-25	7.95	3.80
	26-30	7.90	3.70
	31-35	7.90	3.60
	36-40	7.95	3.55
	41+	8.00	3.50

* Price paid for each plane that passes inspection

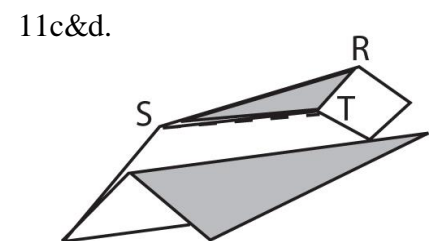
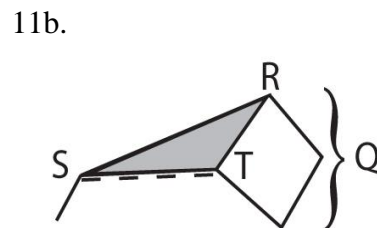
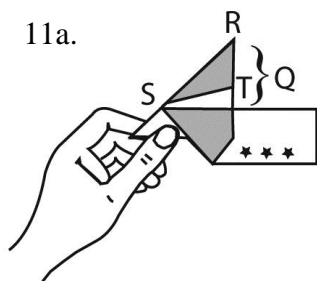
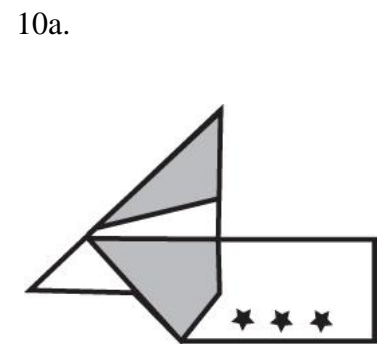
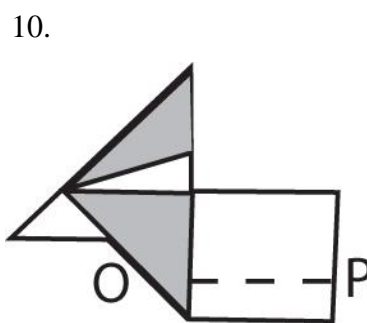
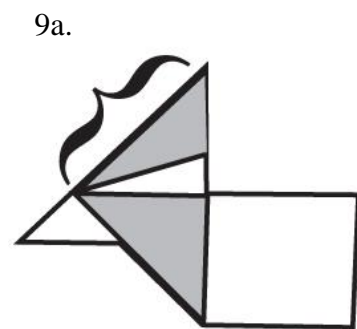
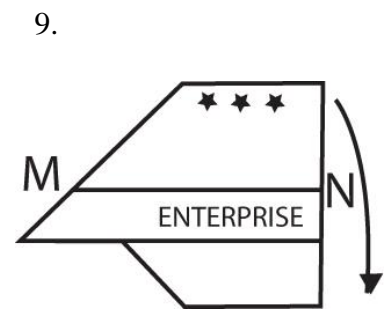
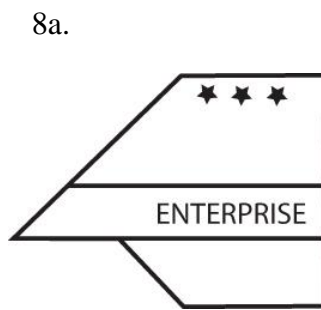
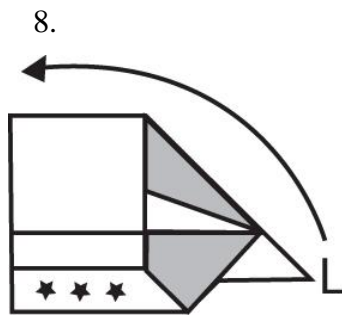
Appendix A Materials Needed Prior to Running the Exercise

JetFighter Folding Instructions⁴ (see <http://jme.sagepub.com/supplemental/>)

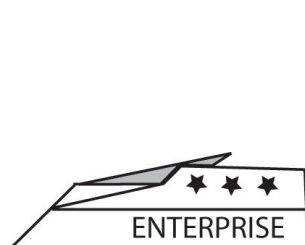
Please read and practice making planes prior to class



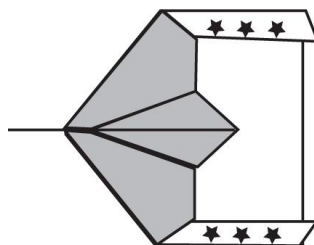
⁴ The folding instructions and the plane template are adapted from Kolb, D. A., Rubin, I.M., & Osland, J. M. (1990). *Organizational Behaviour: An Experiential Approach* (2nd ed). Reproduced with permission.



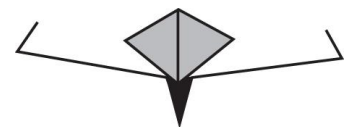
12. Finished planes should look like this:



side view



top view



front view

JetFighter Folding Instructions - Continued

1. You should have a piece of paper that has one blank side, and one side that looks like this.
2. Turn the paper over so that the blank side is facing up and the word “ENTERPRISE” is on the left-hand underneath side. 2a. It should now look like this.
3. Fold corner A to B at the bottom of the paper. 3a. It should now look like this.
4. Fold corner C and D. 4a. It should now look like this.
5. Fold E to F. 5a. It should now look like this.
6. Fold on GH by starting with the part with the stars (* * *) on it and folding down so that the fold comes along the printed solid line. There are three thicknesses of paper – make sure you only fold the first layer. 6a. It should now look like this.
7. Make a fold (up direction) about 1 inch from the bottom along JK. 7a. It should now look like this.
8. Turn the spaceship over and round so that L is on the left side. 8a. It should now look like this.
9. Fold on MN by starting with the part with the stars (* * *) on it and folding down so that the fold comes along the printed solid line. There are two thicknesses of paper – make sure you only fold the top one. 9a. It should now look like this. Make sure this sticks up in the centre.
10. Make a fold (up direction) 1 inch from the bottom along OP. 10a. It should now look like this.
11. Read all of Step 11 and then go back and do it step by step.
 - a) Hold spaceship in hand.
 - b) Open up Q with finger and flatten the lines area by bringing central point R toward the main body of the plane.
 - c) Fold along ST to keep it flat.
 - d) Make wings level so that plane can fly.

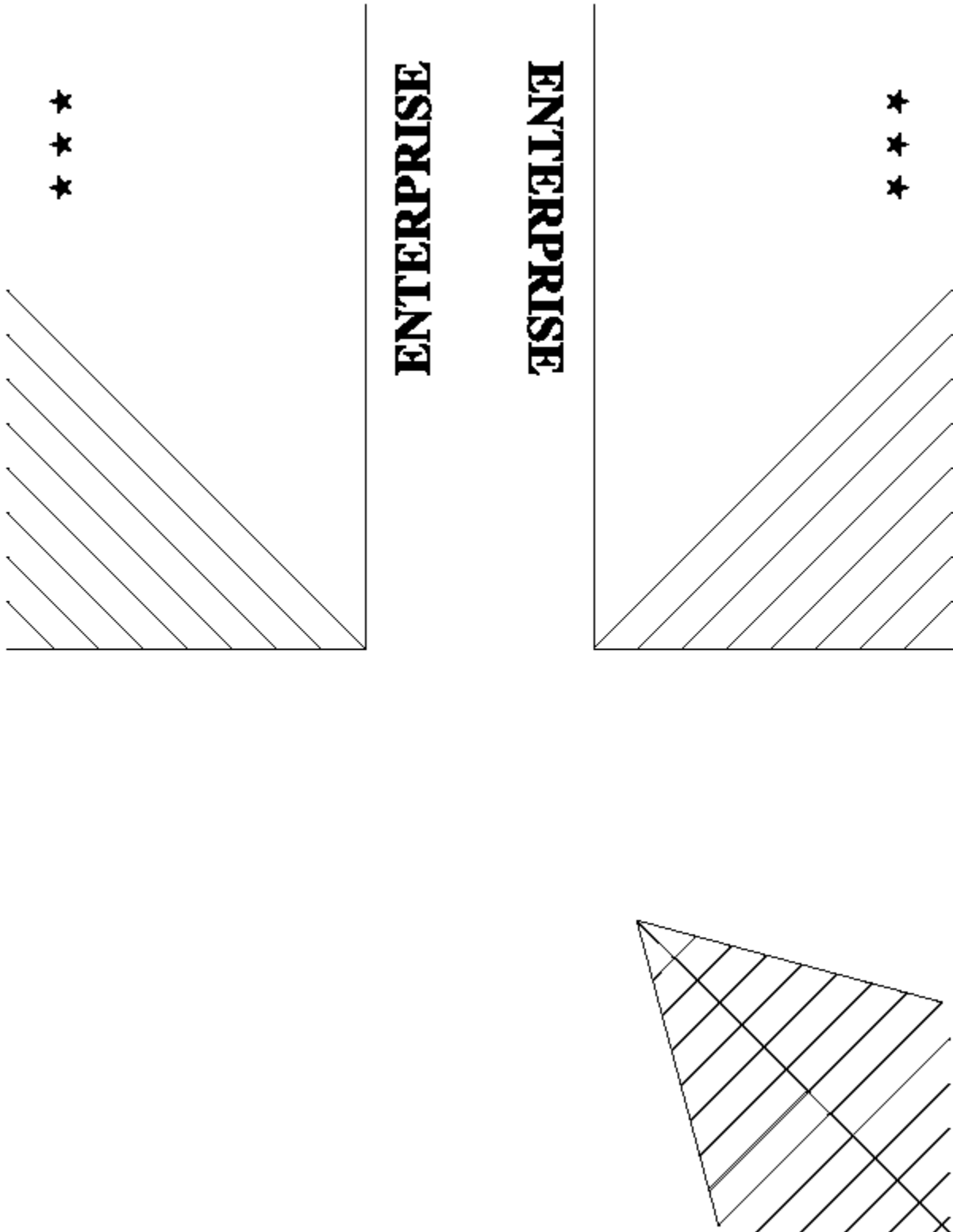
Government Purchase Criteria

1. Printed lines should be in the position shown on the diagram.
2. The wing tips must be turned up 1 inch on each wing and be straight up on both sides.
3. The “pilot’s cabin” (step 11b) must be puffed out considerably. Skinny cabins crowd the fighter pilots. The cabin folds must be creased on the printed lines. The centre cabin line must line up with the nose tip.
4. The two wings must be level and even with each other (i.e., the entire wing deck should be at the same level). The printed lines on the wings must meet in the centre at a 45° angle.
5. The plane’s nose tip should be pointed at a 45° angle.
6. The planes should be able to fly.

Government Purchasing Agents will only buy planes that meet all Government Purchase Criteria and look the same as shown in Step 12 above.

Appendix A
Materials Needed Prior to Running the Exercise

Facsimile of the Plane Template (Not intended for use in the exercise. A file containing the plane template can be found at <http://jme.sagepub.com/supplemental/>)



Appendix B
Hand-outs Needed at the Start of Exercise

Hand-out to each member of the team building the Basic Plane (see
<http://jme.sagepub.com/supplemental/>)

JetFighter Basic Training Plane Information

**Price Paid for each Basic Training Plane that
passes inspection: \$5,000,000 per plane**

Cost for JetFighter Raw Materials ***BASIC TRAINING PLANE***

<u>Raw Materials Purchased</u>	<u>Cost for each</u>
5 (min order size)	\$4,400,000
6-10	\$4,200,000
11-15	\$4,000,000
16-20	\$3,900,000
21-25	\$3,800,000
26-30	\$3,700,000
31-35	\$3,600,000
36-40	\$3,550,000
41+	\$3,500,000

Appendix B
Hand-outs Needed at the Start of Exercise

Hand-out to each member of the team building the Deluxe Plane (see
<http://jme.sagepub.com/supplemental/>)

JetFighter Deluxe Combat Plane Information

**Price paid for each Deluxe Combat Plane
that passes inspection: \$10,000,000 per plane**

Cost for JetFighter Raw Materials **DELUXE COMBAT PLANE**

<u>Raw Materials Purchased</u>	<u>Cost for each</u>
5 (min order size)	\$8,500,000
6-10	\$8,300,000
11-15	\$8,100,000
16-20	\$8,000,000
21-25	\$7,950,000
26-30	\$7,900,000
31-35	\$7,900,000
36-40	\$7,950,000
41+	\$8,000,000

Appendix C
Tables and Figures to be Used During the Exercise

Table 2: Example of a spreadsheet used to calculate each team's profit and loss

Team Results							
Production Period 1							
	Raw Materials Purchased	Cost \$ per Raw Material	Total Cost \$	Planes Passing Inspection	Price \$	Total Revenue \$	Profit (Loss) \$
Team 1	22	3.80	83.60	10	5.00	50.00	-33.60
Team 2	10	4.30	43.00	5	5.00	25.00	-18.00
Team 3	17	8.00	136.00	11	10.00	111.00	-25.00
Team 4	5	8.50	42.50	3	10.00	30.00	-12.50
Production Period 2							
	Raw Materials Purchased	Cost \$ per Raw Material	Total Cost \$	Planes Passing Inspection	Price \$	Total Revenue \$	Profit (Loss) \$
Team 1	10	4.20	42.00	8	5.00	40.00	2.00
Team 2	15	4.00	60.00	13	5.00	65.00	5.00
Team 3	7	8.30	58.10	5	10.00	50.00	-8.10
Team 4	5	8.50	42.50	5	10.00	50.00	7.50

Appendix C
Tables and Figures to be Used During the Exercise

Table 3: How Porter's Activity Drivers May Impact Costs and Revenues in JetFighter

Driver	Potential Impact on Cost or Revenue
<i>Scale</i>	Firms with higher production levels incur lower unit costs. In this case, the more planes purchased, the lower the raw material cost per unit.
<i>Learning</i>	The more times students repeat the steps, the less time required to complete the activity and the greater the quality. There are 18 folds to construct a JetFighter plane. If students specialize in just three folds, they may quickly become experts. Note that activity specialization allows McDonald's Restaurants to quickly train its employees to produce each of its menu items; McDonald's breaks each complex task into several easily mastered steps.
<i>Capacity Utilization</i>	How firms keep production flowing smoothly through their assembly lines and thus have all employees/machines fully utilized. If a student at the end of the line is waiting three minutes for planes to arrive at his or her station, he or she is not being fully utilized. Note that in JetFighter, the goal is to keep an even flow of planes moving through the production line.
<i>Linkages</i>	How an activity impacts the costs incurred or differentiation added in another activity down the production line. For example, installing higher quality bearings reduces after-sales service expenses in washer machines. In JetFighter, an incorrect fold early in the production process is difficult, if not impossible, to rectify later in the production line.
<i>Interrelationships</i>	Can another division of the company help reduce cost or increase differentiation? For example, can separate divisions share purchasing? In JetFighter, students may merge teams and then share buying activities to reduce input cost.
<i>Integration</i>	Is the activity outsourced? Are there ways to lower cost by outsourcing or is it better to keep the activity in-house? In JetFighter, teams may look at outsourcing some activities (for a fee) in order to reduce costs or increase the quality of their planes.
<i>Policy Choices</i>	Choices regarding production strategy, marketing techniques, after sales service, and other strategic tactic to raise the buyer's willingness to pay or reduce cost. For example, teams may decide to decorate their planes in order to increase the willingness of the Government Purchasing Agent of accepting them.
<i>Institutional Factors</i>	What governmental and other institutional regulations impact the cost and revenue of an activity? Can the team alter these so it impacts their team favorably?
<i>Timing</i>	When was the activity started or key assets purchased?
<i>Location</i>	Where are the activities performed relative to our suppliers and customers? Is there an opportunity for teams to move closer to buyers in order to induce more buying or reduce transportation costs and delivery times?

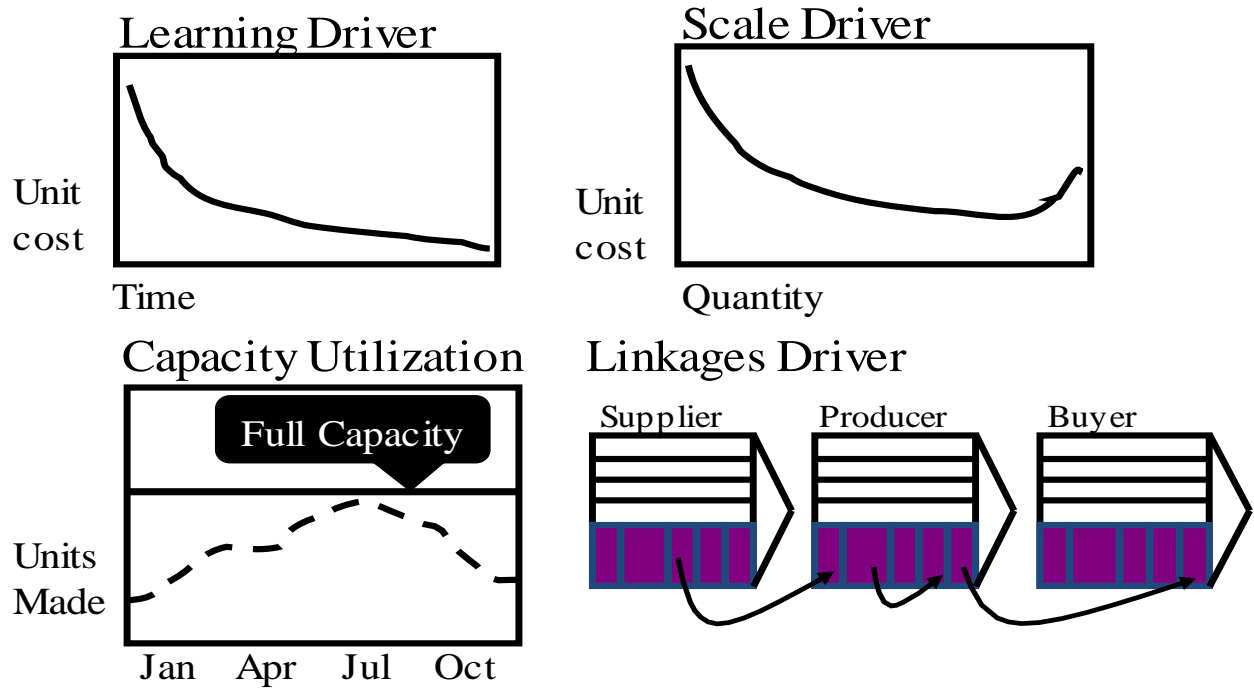
Appendix C
Tables and Figures to be Used During the Exercise

Figure 1: Critical value chain activities for JetFighter teams



Appendix C
Tables and Figures to be Used During the Exercise

Figure 2: Drivers in Graphical Format



Appendix D
Student Feedback Questionnaire

JetFighter: A Value Chain Analysis Exercise
Student Questionnaire

The purpose of this questionnaire is to learn some of your reactions to the “JetFighter Exercise”. This feedback will be used to revise the exercise and submit it for publication in a management education journal. Please do not give your name on this questionnaire so that you feel free to provide your honest opinions. Your comments below *may* be quoted in teaching notes that would be published with the exercise, but because you are not identifying yourself they will remain completely anonymous.

Who You Are

1. How old are you? _____ years
2. How many years of university have you completed? _____ years
3. What grade do you expect to receive in this course _____%

How You Prepared

1. Did you read the assigned readings before coming to class? Yes / No
2. Have you ever undertaken value chain analysis prior to attending this class Yes / No

What You Thought

1. Answer each of the following questions by circling the number that best corresponds to how you feel about the case.

a) How much did the exercise help you understand how to perform value chain analysis?

Unhelpful 1 2 3 4 5 6 7 8 9 10 *Helpful*

b) How interesting was the JetFighter Exercise?

Boring 1 2 3 4 5 6 7 8 9 10 *Interesting*

--- PLEASE TURN OVER ---

2. Did you find anything in the exercise unclear or unrealistic? If so, what specific parts of the exercise were unclear or unrealistic?

3. Would you have liked any additional information to aid in your understanding? What information?

4. Would you recommend that instructors at other universities use this exercise? YES / NO

Why or Why not?

5. In the space below, please provide any other comments you have regarding the exercise.

Thank you for your help!