Classify me! : A Kraljic Portfolio Matrix Exercise

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This article introduces an exercise that simulates The Kraljic Purchasing Matrix (KPM) in a negotiation game. The players will be assigned the roles of a typical buyer and supplier in the automotive industry. Participants will be assigned to groups where they are given the task to source parts for a fictional automotive firm and to negotiate contracts with each other through a number of rounds. The group will be split into a buyer and supplier group to represent each side of the negotiation process. Each group will be given a specific commodity to source and classify base on a quadrant from the KPM. The groups will negotiate with each other and determine pricing and order volumes for each set of commodity. The groups will then be scored based on predetermine weights that are unique to the buyer/supplier based on the quadrants of the KPM. The exercise is easy to implement with just preprinted cards and a moderator and is suitable as a classroom exercise to explain the KPM model.

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1. INTRODUCTION

The Kraljic matrix is a strategic tool coin by Peter Kraljic in 1983 that was intended to guide purchasing managers to recognize here strength and weaknesses of their respective purchasing strategies (Kralijc 1983). Karlijc (1983) states that the role of the KPM gains more importance when the value of the purchasing function increases. A fundamental aspect of Supply chain management is the sourcing and negotiation of supplies to aid in business operations. Terms stated in the contract included specifications of the commodity bought, price paid, quantity discount and information sharing. This has led to an increase in the importance of strategic sourcing where the procurement process is constantly being re-evaluated. A key component in strategic sourcing is by applying various models like the Kraljic matrix to the firms purchasing strategy. Models like the Kraljic matrix can aid in the negotiation process by analyzing a firms list of purchases and deciding the importance of each commodity purchase through the KPM (Lee and Drake 2009). The aim of this paper is to introduce the concept of the KPM model in the form an interactive game that can be used to educate students and professionals in the supply chain field. The game provides a learning platform by giving students a simulated case where they can apply supply chain principles taught in class (Katsaliaki and Brailsford 2007). Students on the effects of proper classification of commodities using the KPM and the effects it has during the negotiation process.

The paper will consist of a short literature review where the KPM model is described. Section 3 will highlight the importance of the KPM in supply chain negotiations and what strategy to use based on how the commodity is classified. The paper will then explain the effects of serious games as a learning tool for supply chain concepts. This will be used as an introduction before the rules of the game are explained.

Section 4 and 5 of the paper will be used to explain the rules of the game and how to apply it in a class room setting along with requirements and learning goals.
The paper will end in a results section that will serve as a analysis of how the game was conducted in a real life setting as well as serve as a discussion section.

2. KRAJIC MATRIX AND ITS AXIS

To aid purchasing managers in their decision making on negotiating on future purchases, Kraljic (1983) developed a matrix to split up commodities into different quadrant based on the importance of the component poses to the value of the finished product and the complexity of the supply market. The Model helps purchasers understand where their products are classified in terms of supply risk and profit contribution, and also know whether the balance of power lies with he purchaser or with the suppliers.

Once the commodity has been properly classified, one can select an appropriate purchasing strategy. Kraljic proposed a purchasing portfolio model with the main purpose of minimizing supply vulnerability and making the most out of the buying power. He developed the Kraljic Portfolio Matrix to match the needs of the buying firm and the various external risks involved in the procurement process. (Refer to Figure 1)

Figure 1. Kraljic Portfolio Matrix (KPM)

2.1 Supply Risk AXIS

Kraljic (1983) defined supply risk as how susceptible a commodity is to disruptions in its availability. This can be because a commodity is made up of a scarce raw materials or the supply is restricted due to lack of suppliers able to produce.

To better illustrate the factors of supply risk impact Wagner, Padi and Bode (2013) defined the supply risk of a commodity using three factors:

1) The market risk- of the commodity is based on the amount of supplier

2) Performance risk- which translates to quality and performance issues of the supplier and finally

3) Complexity risk – risk which are associated with standardizing a product or service. A example would be moving all production of a product to one country to safe cost but puts it at greater risk if there is an accident in that plant which would cause delays because of no alternative production facilities.

2.2 Profit Risk AXIS

The profit risk axis is used to classify commodities based on how the commodity adds to the value of the organizations output. (Kraljic 1983) I.e. a 10% discount on a critical component like an engine would have an impact on the profits of the c ar.

Wagner (2013) further defines profit impact by

1) Impact on profitability – the profit yielded from purchasing a specific commodity

2) Importance of purchases – answering the question of how important is the commodity to the organization

3) Value of the purchase- This takes into account both the tangible and intangible cost associated with the purchase of the commodity. The purchasing

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2.3 Aligning Kraljic's model to purchasing strategy

Purchasing strategy can be clearer defined when you combine both axis of Kraljic's model. The KPM divides commodities a firm buys into 4 quadrants;

Leverage – In this quadrant the typically market conditions suits the buying firm because of the low supply risk the commodity possess. A possible explanation could be that there is a wide variety of suppliers who offer the same or similar commodity and the buyer is able to let the suppliers compete for the business.

Exploitation strategy should be used because the buyer has full purchasing power.

Strategic – The strategic quadrant is used in instances where a commodity has a high supply risk as well as high impact to profitability. These items generally are complex parts like the engine of a car where it has a huge profit impact as well as a bigger supply risk due to the importance of the item

Collaboration strategy should be used with supplier due to high value and high supply risk

Non-critical – This quadrant is where mainly generic commodities that are low value are sold. At example would be stationaries like pens and paper. They do not have much value on the final product but still serve a purpose therefore jus ensuring that the product s are delivered with the lowest possible cost.

The commodities in this quadrant are of low value and low risk so the strategy is to limit optimize and efficient processing

Bottleneck – The bottleneck quadrant is a position that the buying firm should try to avoid. This are usually commodities that are low value but have a huge financial impact on a firm if they are without it. An example could be spare parts for a discontinued car.

Due to the critical supply risk this quadrant performs the strategy is to ensure the supply of this key commodity and in the long run to find substitutes that do not have high amounts of supply risks.

3. KRAJLIC EFFECTS ON NEGOTIATION STRATEGY

The KPM could, depending on how the commodity is classified have an effect on how a firm negotiates over a commodity. Caniëls and Gelderman (2005) argue that there is typically one purchasing strategy that fits best for each quadrant in the KPM model. There are two approaches that this literature highlights in regards to the KPM. First a cooperative strategy can be used where a win-win scenario is projected for commodities in the KPM. One would pursue this strategy when there is a high investment by both parties (Strategic quadrant). In contrast a competitive strategy where a Win-lose relationship occurs due to one party holding more power in the relationship and

can influence the other (Ramsay 2004). This type of strategy would fit in most of the other quadrants of the KPM. .

4. PEDADGOGICAL GAMES AS A LEARNING TOOL

Pedagogical games are serious games that are used to provide an enhanced learning experience over conventional learning (Pasin & Giroux, 2011). These games are to help user to better understand management topics. The most well know pedagogical game is the "Beer game "created by the MIT Sloan School of management in the field of operations management (Sterman 1989). It was create to help students understand the concept of the bullwhip effect via an interactive simulation where student's objective was to be able to supply enough inventories to meet customers demand while keeping the lowest amount of inventory possible. There have been other games targeted at supply chains but focus more on operational activities of a supply chain (Kanet and Stößlein 2008). The beer game is an example of this where the goal is to find the optimal stock amount. Furthermore the current games regarding negotiations were general in nature and did not describe specific supply management problems. An example would be the game by Gemus and Love (2013) a classic negotiation game between a buyer and wholesaler. However current pedagogical games do not show the effects of proper classification of commodities like in the KPM. The KPM can be used as a tool to better position the power of the buyer before any negotiation takes place. The simulation proposed will educate students on the KPM and how to react to each quadrant during a negation process.
The expected learning outcomes are

1. Adopt a purchasing strategy and assess its usefulness during the negotiation process.
2. Make procurement decisions concurrent with where the commodity sits in the Krajic matrix
3. Make decisions in groups when faced with limited time frames

5. GAME REQUIRMENTS AND RULES
5.1 Requirements:

- A moderator to control the game as well as conducting the analysis
- Preprinted RFQ , Commodities cards and report card for groups to write on
- Game has best results when participants have been brief on the KPM model and basic structure of a negotiation process.

5.2 Game Rules

The main objective of the game is to apply the learning outcomes of the KPM and being able to identify key aspects of each quadrant of the Kraljic matrix (i.e. characteristic of the bottleneck quadrant and how to react) . This will be accomplishing through a negotiation style exercise between a Buyer and Supplier. The participants are split into groups of 1-3 persons and divided into 2 categories: Buyer group and a Supplier Group. The negotiations will be conducted between one Buyer groups with one Supplier group (Shown in figure 2.)
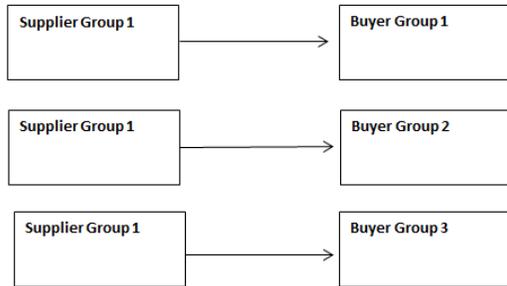

Figure 2. Supply chain between Buyer and Supplier

The Buyers will simulate being in a purchasing department of an automotive company and having to source various components from a supplier. Each Buyer negotiates with a single Supplier and both will have their own specific objective tailored to the specific commodity. Depending on the chosen approach, several outcomes can occur. The approach that the buyer/supplier will take is dependent on where the commodity is position in the KPM. Figure 3 and 4 are examples of commodity cards that both sets of

Figure 3. Example of a commodity card for supplier

Figure 4. Example of a Buyer Commodity Card

Players will receive at the start of the game. The moderator will create the cards beforehand and it is up to the moderator to decide how he/she would make the commodity cards. Both the buyer and supplier will have their own set of weights that the will be judge on later. The buyer/supplier may decide on how much information they want to share with each other depending on what strategy they decide to take. The example commodity card shown is an example of a bottleneck commodity (For illustration purposes the commodity cards list that it is a bottleneck product but when the game is played it will be removed and the teams have to determine the commodity themselves). The weights in the commodity cards should reflect the nature of where it sits in the KPM, For example the buyer's commodity card is weighted 60% on buffer stocks because of the critical nature of the product while less is put on the price because of the chance of delaying production without the product. The supplier on the other hand would be focus entirely on price because they know they can exploit the situation to their advantage.

Each quadrant of the KPM would require their own personalized commodity card with specific weight on different criteria's. The appendix section of this paper has example commodity cards for the other quadrants of the Krajic matrix. The moderator is encouraged to create their own cards and weights. Depending on the approach used, (For each quadrant of the KPM model) the game can end in a win-lose, win-win or a scenario where an agreement could not be reach.

As most quadrants of the KPM are about power balance between buyer/supplier, it can be assumed that most games will end in a win-lose scenario where one party will come up on top. The exception being the strategic quadrant where it's expected that due to the high involvement by both parties that a win-win scenario would be pursed instead.

To determine a winner a simple formula will be used in the case for our example:

Buyer: (.60)(Buffer Stocks) + (Total price paid + total order cost) (.40)

The most important criteria the buyer should focus on is ensure the supply of this commodity. Therefore 60% of the weights would give to any extra inventory over the stipulated demand. This score will be added to the paid price – any order cost

Supplier:
(1)(Total sale - Total production cost)(Batch cost + production prices per unit)

The supplier focus here is just to maximize the profit and so the score will be calculate by total sale amount – total cost (batch cost , production cost). The final amount is than multiplied by 100% and the result is the final score point.

To determine a winner the side with the highest final scores after all calculations have been made wins.

Each quadrant of the KPM would require its own set of weights and calculations; they are added and explained in the appendix section.
At the end of the game there is usually a debrief by the moderator to the mass group on key points of each commodity card (I.e. what strategy should be adopted)

6.0 IMPLEMNTING THE GAME IN A CLASS SETTING

The game is targeted for a class room setting and would require 90 minutes in total. The first section would consist of explaining the game itself and the rules and would take up no more than 30 minutes. This will also include assess how many participants there are and splitting up the groups into 1-3 person teams (depending on size of group) and assigning them either as a supplier/buyer ensuring equal amount of both.

The moderator will brief each group about the supply chain aspect of the game (automobile industry) and the structure of the game (Figure 5) as well as the steps for the negotiation process. (Figure 6)

Figure 6. Negotiation Steps

Figure 5. Structure of the game

6.1 Steps for Playing the Game

The remaining 60 minutes will be for the participants to play the game, there should be enough time for both sets of players to play 2 rounds where they switch roles after the first round along with a new set of commodity cards. The moderator will be supervising by walking around and offering assistants as needed. They will also manage the time between each negotiation round.

1. Buyer and Supplier are paired off like in figure 2 where one set of buyers will have their own respect supplier group.
2. The players will than began the negotiation process with the buying group drafting up a RFQ (Request for quotation) to the supplier group. Figure 5 is an example of a sample of an RFQ.

Figure 7 Example of an RFQ form

The Request for quotation is up to the buyer to decide the amount and how many months into advance they would like to source. This step should not take more than 5 minutes to not cause too much delay in the game.

3. The delivery of the RFQ signals the start of Round 1 (figure 6), The suppliers may decide to accept or reject the RFQ and offer a counter offer of their own. The group is to keep track of all rounds on separate sheet of paper for review later on. Both groups decide on how much information they would want to reveal to each other (order cost, demand etc...) Each round should last no more than 5 minutes to save time and ensure that both players get a chance to be a buyer.

4. The game continues after the first round only if no agreement was made the previous round or the full demand from the buyer was not met (Figure 6). There will be a maximum of 5 negotiation rounds in total (to ensure there is enough time to switch to switch roles)

5. After the 5th round if there is an agreement between both parties the game ends and the scores are tallied via the formula. And a winner is determined

6. In the event that an agreement was not met or only partial demand was met than the scores will be tallied base on what was accomplish and the winner will be determine by the moderator (Depending on the kind of commodity and its importance)\

7. The Players switch roles and play again with a new set of cards to ensure both players get to be the buyer at least once

8. A short debrief is done by the moderator and what KPM strategies fit best with the commodity cards that were given to the participants to play with. The moderator will reveal the classification of the commodity cards as well as key indicators for each quadrant and the strategy they should have used during the negotiation phases.

7.0 RESULT

The experiment was carried out and tested with students at the University of Twente. The game was tested 5 times (10 commodity cards due to players switching roles after each game).The game appeared to be a good exercise for students in learning the KPM. The exercise also helps by applying the theoretical part of the KPM into a situation where it was implemented in a real world setting. The learning outcomes gains were.

1. Classification of commodities based on the KPM model- Students were able after the game ended and the commodity cards were revealed on if they had classified the commodity right or wrong. In the case of the latter the proctor explained the key aspects of each commodity card. The students were able to identify the strength and weakness of each quadrant of the KPM. (I.e. the bottle neck commodity card and the need for buffer stocks far outweighing the price paid for the unit)

2. Negotiation Strategy- After students had decided how they wanted to classify their commodities, we could see in early round of negotiations (particularly in the Bottleneck and Strategic cards) the participants were going out to achieve a win/lose scenario and were not divulging much information to each other than price and quantity. As the game reach the final negotiation phase in order to not lose the game we see more collaboration and information sharing between the parties. This could be attributed to both parties not wanting to reveal too much in the early stages as it might compromise their positions and due to a lack of trust from both parties.

3. Group decision making- By working in groups of 1-3 per team, students were able to discuss on how they would draft there RFQs and counteroffers. The collaboration help for commodities like the strategic and bottleneck quadrants where participants had to discuss how much information should they reveal to their counterpart during the negotiation phases.

7.1 Observed approach towards the four quadrant of the KPM

1. Strategic- the observed approach from the strategic commodity cards was that most parties took a longer amount of negotiation rounds before being able to come to an agreement (Typically 3-5). The simulation usually ended in a win for one side but both parties were still able to agree on the quantity to order with the buyer being able to meet his minimum of 8000 units to ensure the production. This was done because the

supplier revealed his required quantity for production information. In one case the simulation ended in no agreement which could also explain the critical nature of the commodity where the margins are slim for both sides and proves how this quadrant requires collaboration.

2. Leverage- In this scenario it was observed that the Buyers had the upper hand in the negotiations and were able to meet there demand exactly without incurring the penalty of going over the demand. The suppliers were able to meet their production requirements to manufacture but lost out in the pricing negotiations.

3. Bottleneck- It is expected from the literature that this quadrant would favor the supplier more due to the nature of the commodity. The simulation favored the supplier firm due to the buying firm having a clause that the game will end in an automatic fail for the buyer if no agreement was meet due to the critical nature of the product and not being able to secure it would mean a production halt. Although in some cases the buyer was able to win as long as they were able to ensure a large enough quantity of buffer stock that outweighs the cost aspect.

4. Non-Critical- It was observed during this phase that both parties went for a competitive strategy. In the case of the buyer was to ensure the total demand at the lowest price possible. The supplier had a similar approach by making sure of a profit margin after their respective costs were deducted. This type of negotiations generally ended in the first two negotiation rounds due to the order cost of dragging out the negotiations.

8.0 CONCLUDING REMARKS

To conclude, the simulation serves as an extra teaching tool for teaching the aspects of the KPM model through a negotiation exercise. The simulation will be greatly benefitted by a debriefing session where the groups are gathered together while the moderator gives a more in-depth explanation of the various quadrants. The debriefing session should be done via a summary slide where the participants are back in a large group. The moderator will than list the key points as well as emphasizes in which circumstances one would pursue a collaborative or competitive strategy. Competition is easier to pursue when chasing short term gains while collaborative requires more information sharing and trust between parties benefits for long term gains. Although not explored much in this study the 3rd alternative would be to not have a deal and in this situation for our study no agreement could be reach and would lead to a lost for both parties.

8.1 Future recommendations

The game is originally design as a teaching tool for students to educate on the effects of the Kraljic matrix and how to position their negotiation stance, but the game can also be tailor made to an organization purchasing department for purchasing managers to practice and classify their commodities. Furthermore the exercise could be extended and tested further by allowing multiple Buyers to interact with the same amount of suppliers. This adds some complexity to the game, but offers more accurate depiction of multiple buyer/supplier interactions that a real purchasing firm would encounter. It is to be noted that this study focus on price as an important criteria while other issues that are normally discuss with a supplier (i.e. delivery windows, quality control) were omitted. The purpose was not to over complicate the game with too many variables that might confuse the participants. The game was intended to focus on educating participants on the KPM model and its axis in a. The moderator may add the above mention variables into the commodity cards for a more advanced audience that is already familiar with the KPM and the game could be used as a contracting exercise between a buyer and supplier.

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Example Buyer Commodity card: (Strategic)

Description: Transmission system for our top of the range sports car, it's a new transmission that unlike our current offerings and has a higher cost than our standard transmissions.

Order Cost: $1000   Weights: Price: 40%

Price willing to pay per Unit: Negotiation with buyer   Ensuring demand amount: 60%

Estimated demand:

Jan	Feb	March	April	May
1700	1350	1800	1000	1750

Example Supplier Commodity card: (Strategic)

Commodity: Transmission system for a sports car, few able to produce due to technical requirements but high cost in producing due to new technology means needing a large quantity order to meet cost

Production cost per batch per month: $1000   Weights:

Production Price per Unit: $1750   Price: 40%

Sales price: Negotiate with Buyer   Selling production amount: 60%

Hint: You need to sell at least 8000 units to justify production

10. Appendix

Commodity cards and formulas:

Strategic –

Buyer: (.40 (Total price paid – Total order costs) + (.60)(≤7600)
The buyer would need to ensure he has the demand so the minimum amount they must purchase is 7600 while any additional amount would add to the price paid.

Supplier: (.40)(Total sale - Total production cost) + (.60)(≤8000)

The High cost of this commodity as well as the required 8000 units to produce means that they need to agree to produce at least 8000 if they want to score any points

*The weights for this quadrant are weighted where even though for example the buyer is the winner the supplier is still able to win if they manage to convince the buyer to incur the extra cost to produce more than the required amount to meet the supplier's minimum production quantity.

Example Supplier Commodity card: (Non-critical)

Commodity: Standard A4 white copy paper that is sold by many competitors

Production cost per batch per month: $100   Weights:

Production Price per Unit: $2   Price per unit: 100%

Sales price: Negotiate with Buyer

Hint: You need to sell at least 500 units to justify production

Example Buyer Commodity card: (Non-critical)

Description: White A4 size print paper to be used by the entire factory and various departments. Pooled demand from all departments

Order Cost: $100   Weights:

    Lowering Total Cost: 100%

Price willing to pay per Unit: $5

Jan	Feb	March	April	May
500	580	675	800	450

Non-critical –

Buyer: (1) (Total price paid – Total order costs)
As this a noncritical quadrant full weight for the buyer is to lower cost in total. 100% of the weights will be towards the total cost amount.

Supplier: (1)(Total sale - Total production cost)(Batch cost + production prices per unit)
The supplier will be decided by subtracting total sales – any production cost.

Example Buyer Commodity card: (Leverage)

Description: Full Exhaust system for our new mid-size sedan, it is a critical component to the car but there are multiple suppliers who are able to produce the product. It is imperative to have the item to meet demand needs

Order Cost: $1000   **Weights:**

                                                        Price: 60%

Price willing to pay per Unit: negotiate with supplier   **Meeting the Demand:** 40%

Estimated demand:

Jan	Feb	March	April	May
1000	2000	500	500	1000

Example Supplier Commodity card: (Leverage)

Commodity: Full Exhaust system the current products we offer for this category is similar to many of our competitors so it's imperative to secure a deal with the supplier

Production cost per batch per month: $450   Weights:

                                                        Sale Price: 40%

Production Price per Unit: $500   **Additional sales pass 5000:** 60%

Sales price: Negotiate with Buyer

Hint: You need to sell at least 5000 units to justify production

Leverage –

Buyer: (.60) (Total price paid) + (.40)(= 5000) if < or > 5000 than score drops to .30
The weights will be scored by price being 60% because it expected that the buyer should be able to dictate the negotiation process. Meeting demand being weighted as 40% indicates that the buyer should considere a lean approach and will be scored the full 40% if they manage to meet the demand exactly and will be lowered to 30% if they are over or under the indicated amount.

Supplier: (.40)(Total sales - Total production cost)+ (.60)(< 5000)
The supplier is in a situation where thre is multiple supplieres of the product so ensuring that they are the choice supplier is the piority. An example is that if a supplier is able to sell more than 5000 units the additional units are than multiplied by .60 and than added to the profit score.

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