Analyzing and capturing lessons learned in procurement strategy

A Kraljic Portfolio Matrix analysis of the Maasvlakte Power Plant 3 project

UNIVERSITY OF TWENTE.

Analyzing and capturing lessons learned in procurement strategy

A Kraljic Portfolio Matrix analysis of the Maasvlakte Power Plant 3 project

Ebony Nijhoff, BCom

Master thesis to obtain the degree of Master of Science in Business Administration

Date of delivery: 13th of December 2013

Period:	September 2012 – December 2013
Name:	Ebony Nijhoff
Student number:	s1111582
Telephone number:	+31(0)6-51550101
E-mail:	e.nijhoff@student.utwente.nl
E-mail:	e.nijhoff@gmail.com

Coordinators

1st coordinator:	Ir. Henk Kroon	University of Twente
2nd coordinator:	Dr. P.C. Schuur	University of Twente
External coordinator:	Cees van Bragt, MSc	E.on Benelux

Educational institution: University of Twente, Enschede, The Netherlands
School of Management and Government
Master Business Administration, specialization Finance

External organization: E.on Benelux, Maasvlakte Power Plant 3, The Netherlands

I. Summary

E.On is Europe's largest private energy provider. At this moment E.On is building a power plant at the Maasvlakte (MPP3), in the Netherlands. Commissioned by the financial project manager of the project, the procurement strategies of the MPP3 project were analyzed by means of the following main research question: "What are the lessons learned for future projects in procurement strategy based on a Kraljic Portfolio matrix analysis and applied at the project Maasvlakte Power Plant 3?". Hence, the goal of this study was to give E.On recommendation on how to arrange the procurement function in future projects in terms of procurement strategies.

The KPM model was developed by Kraljic (1983) to group products by means of profit impact and supply risks. Putting these to variables on two axes result in a matrix which can be divided into four quadrants; strategic quadrant, leverage quadrant, bottleneck quadrant, and non-critical quadrant. Each quadrant proposes a different procurement strategy for the products which fall within the given quadrant; strategic items; long-term relationship, leverage items; competitive bidding, bottleneck items; securing the supply, and non-critical items; low costs

Even though the original model is proven over time to be a trustworthy tool to analyze procurement portfolios, it has never been applied in an project environment. By adding project environment specific variables to evaluate the procurement portfolio, the impact of project specific values were taken into consideration to arrange the portfolio. The variables of the model were:

Vertical axes

It is difficult to make an estimation of the profitability impact, and the value added by the product line, because the construction of the power plant is still ongoing. Therefore it was chosen to only use one variable for the measurement of profit impact. This is the strategic importance of procurement in terms of the percentage of raw materials in total costs. Because the procurement of the MPP3 project took place based on so called 'lots', the contract cost per lot were weighted in terms of the total contract costs, in percentages. In terms of project management this is called the "CAPEX index". Van Weele (2005) states that in sum twenty percent of the products will be responsible for eighty percent of the total costs. This is the break-line between the "high" and "low" CAPEX index.

Horizontal axes

In the original model of Kraljic the horizontal axes is determined by weighting the 'supply risk'. This is the risk based on the product complexity and/or the supply market. Because the model which was built for this research will be used in a project environment, specific project environmental variables were used as well. To overcome some of the disadvantages of the weighted factor method, limited factors were used to determine all the project dependencies per item.
The only requirement was that all the information which was needed for each variable had to be available, otherwise it would be impossible to complete the model with the chosen variables.
Some of the factors were extracted of the original model of and some were extracted from project management theory. The factors are; (1) product complexity, (2) supply market, and (3) project dependence.

Product complexity

"If the item to be purchased is new or particularly complex, the company may have to pay greater attention to the supplier relationship" (Olsen & Ellram, 1997, p. 104). In other words, increase in product (1) novelty or (2) complexity leads to a higher supplier risk. Whereas novelty can reflect on a new technique used to produce a product (production process) or a total new product. And product complexity reflects the complexity of the technology used in the production process (Kraljic, 1983; Olsen & Ellram, 1997).

Supply market
If there is only one supplier whom can supply a specific product, it is difficult to acquire the goods for a low price. In case this only supplier cannot deliver the products you need, you have no other option than to wait or find a substitution (Caniëls & Gelderman, 2005; Gelderman & van Weele, 2003; Kraljic, 1983; Van Weele, 2005). From this factor two variables can be subtracted: (1) The number of suppliers and (2) the possibilities for substitution. The number of suppliers is simply measured by counting the suppliers in absolute numbers. Substitution is the absolute number of substitution possibilities that a product has.

Project dependence
In addition, in a project environment there is a high project dependency in terms of (1) delivery time, (2) product quality, and (3) exposure. In a project environment timing of the delivery is important because every phase in the project is interdependent (Masi, Micheli, & Cagno, 2012). Delays in the delivery will cause additional costs because of the interdependence of the phases (Ronen & Trietsch, 1993). Product quality is described by Masi et al. (2012) as the plant quality dependence on the purchased items. Implying that the quality of the products will affect the quality of the total plant.
Exposure can be described in terms of the cost price of the products. The higher the price, the higher the exposure, and therefore a higher supply risk (Masi et al., 2012).

Weighing the project dependencies
The measurement used to calculate one outcome out of the different variables within the same dimension is the methodology from Narasimhan (1983) which is described in the article of Olsen and Ellram (1997). It is developed to determine the weight of each variable on the lowest level of the hierarchy. Within this methodology the variables can be compared at different levels. The levels to calculate will look like Figure 1.

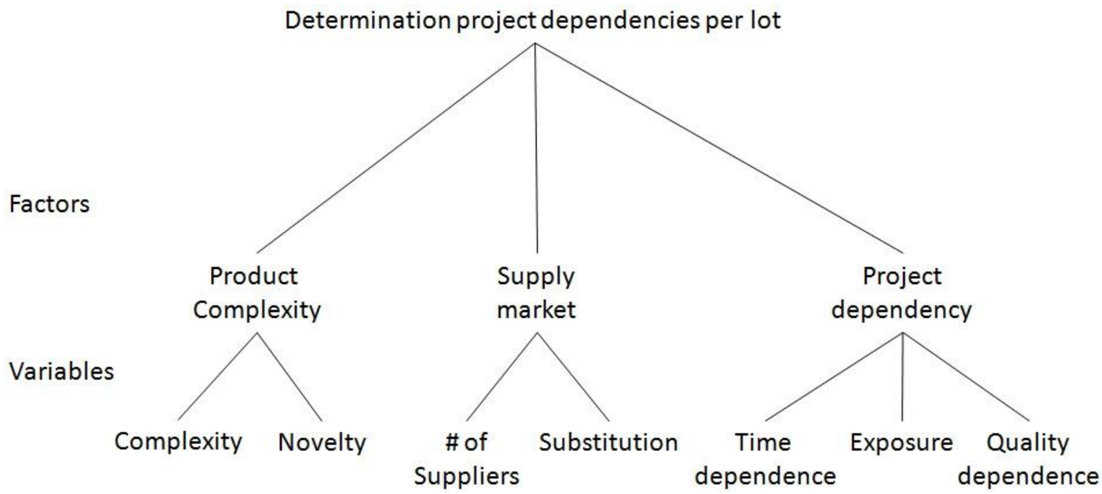

Figure 1 - Determination project dependencies per lot

All the in Figure 1 mentioned variables and factors were calculated as follows;

	f_1	f_2	.....	f_n	Z	W
f_1	X_{11}	X_{12}	.....	X_{1n}	Z_1	W_1
f_2	X_{11}	X_{12}	.....	X_{1n}	Z_2	W_2
......	.....	.....	.....	.....	.....	.....
f_n	X_{n1}	X_{n2}	.....	X_{nn}	Z_n	W_n
				Sum	S	1.0

Table 1 - Schematic overview of the formula (Olsen & Ellram, 1997, p. 112)

Where:

N = The number of variables/factors

fi = A variable/factor

X_{ij} = The result of an evaluation of variable/factor i's importance compared to variable/factor j's importance using a scale from 1 (equally importance) to 9 (absolute importance). If variable/factor i is less important than variable/factor j, x_{ij} is evaluated instead. The matrix is completed by using the equation: $X_{ij} = 1/X_{ji}$

Zi = Geometric mean of row number i:
$Zi = \sqrt[n]{x_{11} * x_{12} * ..... * x_{1n}}$

S = The sum of the geometric means:

$$S=\sum_{f=1}^{n} Z_1$$

W_i = The weight of variable/factors i

As recommended, every variable was scored based on the scale of 1 (low) and 10 (high), with an exception for the variables 'number of suppliers' and 'number of possible substitutions'. These two variables were filled in based on the actual number of supplier. The reason for this distinguish was because Van Weele (2005) states that products with only one or two suppliers have a high supply risk. In this case consensus to fill in these products was needed. Like Gelderman and van Weele (2003) note there are always exceptions on the outcome of the classification. Nevertheless, a score was given afterwards to the supply market variables to get an insight on how the matrix would look like if the variables were scored based on the scale 1 to 10. The following scale was used:

1 supplier = score 10
2 suppliers = score 9
3 suppliers = score 8
4 suppliers = score 7
> 5 suppliers = score 4
> 10 suppliers = score 2
> 20 suppliers = score 1

The score of each variable was multiplied by the weighting of that variable. Each of these outcomes per variable was added up. The outcome of the equation is the score of the project dependency of that individual lot (Olsen & Ellram, 1997).

The break-line to determine whether the supply risk is low or high, was set at 5.5 points or in this case 55%. This division is in line with the proposed methodology of Gelderman (2004). Meaning that every lot with an outcome lower than 55% has a low supply risk and everything above 55% has a high supply risk.

This customized model was used to analyze the procurement portfolio of the MPP3 project, and adds value to existing procurement theory in project environments, since there is little known about how to handle procurement portfolios in project environments. Also, the model is tested and validated in a project of E.On, which makes it an usable model for E.On to use in future projects to determine the procurement portfolio.

The model was established by assessments of the project managers and the project director. After the procurement portfolio was divided into the four quadrants, nine lots, two from each quadrant and three from the strategic quadrant, were chosen to research more in-depth by means of interviews with the lot team of each lot. In total 31 interviews were conducted.

II. Acknowledgements

In my years as a student I have faced many challenges. By far, writing my master thesis was the biggest challenge of them all. In the past one and a half year I have faced many struggles both personally as study related. Now that I have overcome them all, it is my greatest pleasure to present this report about the lessons learned in procurement strategies that should be implemented in the procurement function of E.On in future projects. Without the help of many, I would not have accomplished this. I would like to take this opportunity to thank the following people:

First, I want to thank E.On Benelux for making it possible for me to write my thesis in an international project environment. Special thanks goes out to Cees van Bragt, my supervisor at E.On. for the valuable insights, advice, support, and for his understanding that things did not worked out as planned in terms of time. Also, my gratitude goes out to all of the people working at the MPP3 project, for your support, sympathy, and making me feel welcome and a true member of the project. To the people whom have contributed insights for my research, cooperated with the interviews, and filled in the assessments, thank you so much for your time, input, flexibility, and advice! Without you this was not possible to acquire.

Furthermore, I would like to thank Henk Kroon for supervising me on behalf of the university of Twente. Thank you for your insights and advice, not only study related but also for making me a better person by making me understand that it is always useful to know what your own limits are and listen to them. I would also like to thank dr. P.C. Schuur for reading my report in the last stages and giving me feedback to finalize my report.

Last but not least, I want to thank all of my family and friends for their support and encouragement throughout my whole study career. Special thanks goes out to my stepfather Mees van der Horst, for helping me finding an interesting assignment and providing me with insights and feedback all the way through. Also a special word of thanks goes out to both of my loving parents. My mother who provided me with the best food one could imagine during my time at the Maasvlakte, and her knowledge of the English language which made me a better writer. And my father for always believing in me, encouraging me to get the best out of myself, and helping me accept that perfection is not always a virtue. Also to all my other family members and friends who remain unnamed here, your encouragement and support will never go in vain, since you all helped me to become the person who I am now, so thank you!

Hengelo, December 2013

Ebony Nijhoff

Bibliography

Abdul-Kadir, M. R., & Price, A. D. F. (1995). Conceptual phase of construction projects. *International Journal of Project Management, 13*(6), 387-393. doi: 10.1016/0263-7863(96)81776-5

Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. *International Journal of Project Management, 17*(6), 337-342. doi: 10.1016/s0263-7863(98)00069-6

Babbie, E. R. (2010). *The practice of social research* (12th ed.). Belmont, Calif: Wadsworth Cengage.

. Building the Maasvlakte Power Plant 3. (2008) *Building the* (pp. 1-20).

Caniëls, M. C. J., & Gelderman, C. J. (2005). Purchasing strategies in the Kraljic matrix - A power and dependence perspective. *Journal of Purchasing and Supply Management, 11*, 141-155.

Cooke-Davies, T. (2002). The “real” success factors on projects. *International Journal of Project Management, 20*(3), 185-190. doi: 10.1016/s0263-7863(01)00067-9

de Boer, L., Labro, E., & Morlacchi, P. (2001). A review of methods supporting supplier selection. *European Journal of Purchasing and Supply Management*, 75-89.

de Wit, A. (1988). Measurement of project success. *International Journal of Project Management, 6*(3), 164-170. doi: 10.1016/0263-7863(88)90043-9

E.on. (2012, July 18). *Website of E.On Benelux N.V.* Retrieved from http://www.eon.nl

Eon-Benelux. (2012). New power plant on the Maasvlakte. Rotterdam, Nederland.

Gelderman, C. J. (2004). *De inkoopportfolio*. Alphen aan den Rijn: Kluwer

Gelderman, C. J., & Semeijn, J. (2006). Managing the global supply base through purchasing portfolio management. *Journal of Purchasing and Supply Management, 12*, 209-217.

Gelderman, C. J., & van Weele, A. J. (2003). Handling measurement issues and strategic directions in Kraljic's purchasing portfolio model. *Journal of Purchasing and Supply Management, 9*, 207-216.

Gelderman, C. J., & van Weele, A. J. (2005). Purchasing portfolio models: A critique and update. *The journal of Supply Chain Management*(Summer), 19-28.

Haughey, D. (Producer). (2009, 3 October 2012). An introduction to project management. Retrieved from http://www.projectsmart.co.uk/introduction-to-project-management.html

Kerzner, H., Ph.D. (2009). *Project management: A systems approach to planning, scheduling, and controlling* (10th ed.). New York: John Wiley & Sons, Inc.

Kraljic, P. (1983). Purchasing Must Become Supply Management. *Harvard Business Review*(83509), 1-13.

Masi, D., Micheli, G. J. L., & Cagno, E. (2012). *A meta-model for choosing a supplier selection technique within an EPC company*. Journal of Purchasing and Supply Management. Retrieved from http://www.sciencedirect.com/science/article/pii/S1478409212000349

Munns, A. K., & Bjeirmi, B. F. (1996). The role of project management in achieving project success. *International Journal of Project Management, 14*(2), 81-87. doi: 10.1016/0263-7863(95)00057-7

Nellore, R., & Soderquist, K. (2000). Portfolio approaches to procurement - Analysing the missing link to specifications. *Long Range Planning, 33*(2), 245-267.

Olsen, R. F., & Ellram, L. M. (1997). A portfolio approach to supplier relationships. *Industrial Marketing Management, 26*(2), 101-113.

Qureshi, T. M., Warraich, A. S., & Hijazi, S. T. (2009). Significance of project management performance assessment (PMPA) model. *International Journal of Project Management, 27*(4), 378-388. doi: 10.1016/j.ijproman.2008.05.001

Ramsay, J. (1994). Purchasing power. *European Journal of Purchasing & Supply Management, 3*(1), 125-138.

Ronen, B., & Trietsch, D. (1993). Optimal scheduling of purchasing orders for large projects. *European Journal of Operational Research, 68*(2), 185-195. doi: 10.1016/0377-2217(93)90302-4

Van Weele, A. J. (2005). *Inkoop in strategisch perspectief*. Alphen aan den Rijn: Kluwer bv.

Virolainen, V.-M. (1998). A survey of procurement strategy development in industrial companies. *International Journal of Production Economics, 56–57*(0), 677-688. doi: 10.1016/s0925-5273(98)00009-7

Wu, C., & Barnes, D. (2011). A literature review of decision-making models and approaches for partner selection in agile supply chains. *Journal of Purchasing and Supply Management, 17*(4), 256-274. doi: DOI 10.1016/j.pursup.2011.09.002

Yeo, K. T., & Ning, J. H. (2002). Integrating supply chain and critical chain concepts in engineer-procure-construct (EPC) projects. *International Journal of Project Management, 20*(4), 253-262. doi: 10.1016/s0263-7863(01)00021-7

Yeo, K. T., & Ning, J. H. (2006). Managing uncertainty in major equipment procurement in engineering projects. *European Journal of Operational Research, 171*(1), 123-134. doi: 10.1016/j.ejor.2004.06.036