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Network Instruments Inc.: The Warehousing Dilemma

It was 9 pm GMT, yet Michael Russell (Michael), VP, Supply Chain, Network Instruments Inc. (NI) was in office. It was a chilly January 2010 night. Michael, was staring at the London Bridge from his office window and was thinking about the presentation, which he was to make to the CEO and CFO the next morning. The last year had not been a good one for the Supply Chain function. Though there was no unmet demand, the inventory and transportation costs had gone up. One of the contract manufacturers could not supply the goods due to political disturbances and hence Michael had to source from a substitute contract manufacturer at a higher cost.

NI is a leading networking solution provider with flagship products like Routers RX III, Routers SX III, Switches and Video Conferencing Unit. Worldwide, it has a turnover of $20 billion and enjoys a market share of 70%. The supply chain

This Caselet was written by Sandeep Chatterjee, IIM Kozhikode (Batch of 2003) and Associate Director, KPMG. It is intended to be used as the basis for classroom discussion rather than to illustrate either effective or ineffective handling of a management situation. The caselet is based on generalized experiences.

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entities consist of the company itself, Contract Manufacturers, Third Party Logistics Providers, Distributors and Customers. The Company does the design while the contract manufacturers manufacture the finished goods. The transportation from contract manufacturers to the company owned warehouse and from the company-owned warehouse to the customer is handled by third party logistics provider. The customs clearance and in-country selling is done by the distributors.

Though it has been doing well worldwide, Europe had been a matter of concern. Though the market has grown substantially, the company had lost market share in all product categories. The profitability had gone down due to rising supply chain costs.

The company procures goods from the following contract manufacturers for its European operations:

- Moxconn in Shanghai, China
- Virat in Bangalore, India
- Lestica in Bangkok, Thailand

Not all contract manufacturers manufacture all products and the sourcing mix is decided based on the multiplication of total cost (manufacturing and transportation costs) and risk factor. The least product cost including the risk factor gets a priority taking into consideration capacity constraints. In 2009, Lestica could not supply its quota due to a political disturbance and hence the company had to source it from Finpul in Kuala Lumpur, Malaysia at a higher cost as the other contract manufacturers did not have enough additional capacity. NI is contemplating adding Finpul in its approved manufacturer's list and assign a risk factor to each of the contract manufacturers. In addition, each contract manufacturer caters to multiple customers and is not exclusive. Exhibit I illustrates the capacity and risk factor details.

Exhibit I: Capacity and Risk Factor (as of December 2009)

Contract Manufacturer	Routers RX III Capacity Units (per month)	Routers SX III Capacity Units (per month)	Video Conferencing Unit Capacity Units (per month)	Switches Capacity Units (per month)	Risk Factor (lower value implies lesser Risk)
Moxconn	4000	4000	6000	2000	0.1
Virat	4000	2000	NA	4000	0.2
Lestica	3000	4000	4000	4000	0.6
Finpul	3000	3000	2000	2000	0.3

Compiled by the author

The company has only one-third party logistics provider, AXZ, which is responsible for transportation of both legs (Contract Manufacturer to Company Warehouse and Company Warehouse to Customer). Available Truckloads are 200 units of ROUTER RX III or 150 units of ROUTER SX III or 1 unit of VIDEOCONFERENCING UNIT or 300 Units of SWITCHES. The company can choose to ship partial truckloads but they have to bear the full fixed cost. Mixing of different products in each truck is not allowed due to legal issues during customs clearance. Transportation occurs in Truckloads (mix of Road and Air) and the average fixed cost per truckload (mix of Road and Air) for all destinations is €5000 per truck. The company has a European Central Warehouse (ECW) at Amsterdam, Netherlands. All European customers are served through this warehouse. The company is also contemplating a warehouse at London (LW). Exhibit II has the lead time and variable transportation costs (same for all products) for Leg 1 (Contract Manufacturer to Company-owned Warehouse).

Exhibit II: Lead Time and Variable Transportation Costs for Leg 1*

Contract Manufacturer	Average Manufacturing Lead Time across all Products	Transportation Lead Time to European Central Warehouse	Variable Transportation Cost to European Central Warehouse	Transportation Lead Time to London Warehouse (estimated)	Variable Transportation Cost to London Warehouse (estimated)
Moxconn in Shanghai, China	21 days	10 days	€45 /Unit/Day	11 days	€40 /Unit/Day
Virat in Bangalore, India	25 days	12 days	INR3000/ Unit/Day	12 days	INR3000/ Unit/Day
Lestica in Bangkok, Thailand	24 days	15 days	฿[1]2000/ Unit/Day	15 days	฿1900/ Unit/Day
Finpul in Kuala Lumpur, Malaysia	23 days	14 days	RM200/ Unit/Day	14 days	RM200/ Unit/Day

*Same for all units, average Fixed Cost per Truck (Road + Air) is €5000

Exhibit III has the currency exchange details:

Exhibit III: Currency Exchange Rate

€1 = INR62

฿1 = €0.024

RM1 = €0.23

Compiled by the author

[1] Thai Baht is the currency of Thailand with the symbol ฿

For Leg 2, available Truck-loads are 200 units of ROUTER RX III or 150 units of ROUTER SX III or 1 unit of VIDEOCONFERENCING UNIT or 300 Units of SWITCHES. The company can choose to ship partial truck-loads but they have to bear the full fixed cost. Mixing of different products in each truck is not allowed due to legal issues during customs clearance. Transportation occurs in Truck-Loads (mix of Road and Air) and the average fixed cost per truck load (mix of Road and Air) for all destinations is €5000 per truck. For Leg 2 (Company Warehouse to Customer), the average Fixed Cost per Truck (Road + Air) is €5000. The company caters to 8 cities (market). The variable cost is same for all units. Exhibit IV has the details of the Leg 2 Transportation Costs.

Exhibit IV: Lead Time and Variable Transportation Costs (same for all Units) for Leg 2*

Market	Distance from European Central Warehouse (Miles)	Lead Time (Days)	Variable Transportation Cost (Per Unit per Mile) from ECW (in €)	Distance from London Warehouse (Miles)	Lead Time (Days)	Variable Transportation Cost (Per Unit per Mile) from LW (in €)
Amsterdam	2	0.5	45	310	2	65
London	307	2	65	3	0.5	65
Paris	319	2	52	257	2	60
Stockholm	886	7	50	889	7	72
Kiev	1105	8	57	1324	10	40
Moscow	1333	10	54	1552	11	45
Rome	1140	8	70	1118	8	50
Helsinki	932	7	45	1133	8	45

*Average Fixed Cost per Truck (Road + Air) is €5000

Compiled by the author

The company plans to maintain a service level of 95% for the customer. There is an Ordering Cost for the company when it places the order to the Contract Manufacturer. Every year the company forecasts its sales and shares the forecast with the contract manufacturer. The contract manufacturer then makes a supply commit in terms of schedule and units. Exhibit V has the ordering cost details.

Exhibit V: Ordering Cost for Company when the order is Placed to Contract Manufacturer				
Contract Manufacturers	**Routers RX III Ordering Cost (per unit in €)**	**Routers SX III Ordering Cost (per unit)**	**Video Conferencing Unit Ordering Cost (per unit in €)**	**Switches Ordering Cost (per unit in €)**
Moxconn	3	4	10	2
Virat	3	3	12	2
Lestica	3	4	10	3
Finpul	4	4	11	2
Compiled by the author				

There is a fixed cost of €50000 per year for operating the Amsterdam warehouse. The estimated fixed cost for operating the London warehouse is €40000 per year. There is an additional cost of €40000 in setting up the London warehouse. The variable warehouse costs are given in Exhibit VI.

Exhibit VI: Variable Storage Costs for Each Product per Unit for ECW and LW (estimated)			
Variable Storage Cost for Routers RX III in ECW (Per Unit in €)	**Variable Storage Cost for Video Conferencing Unit in ECW (Per Unit in €)**	**Variable Storage Cost for Switches in ECW (Per Unit in €)**	**Variable Storage Cost for Routers SX III in ECW (Per Unit in €)**
35	70	50	40
Variable Storage Cost for Routers RX III in LW (Per Unit) Estimated	**Variable Storage Cost for Video Conferencing Unit in LW (Per Unit) Estimated**	**Variable Storage Cost for Switches in LW (Per Unit) Estimated**	**Variable Storage Cost for Routers SX III in LW (Per Unit) Estimated**
25	50	30	20
Compiled by the author			

The European market size was €5 billion in 2009 and is slated to grow 10% every year for the next 10 years. Exhibit VII has the details of the Pricing and market share in terms of no of units.

Exhibit VII: Price and Market Share* (in 2009)		
Product	**Price(in €) in 2009**	**Market Share in 2009**
ROUTERS RX III	100	20%
ROUTERS SX III	150	20%
VIDEOCONFERENCING UNIT	500	40%
SWITCHES	200	30%
*The market share for Routers is a consolidated one		
Compiled by the author		

The company has an ambitious plan of increasing its market share by 2% every year for Videoconferencing unit and 3% every year for Routers and Switches over the next 5 years.

Exhibit VIII has the details of the Closing Inventory each month for 2009.

Exhibit VIII: Monthly Closing Inventory (2009)

Month	ROUTERS RX III Closing Inventory (in Units)	VIDEO CONFERENCING UNIT Closing Inventory (in Units)	SWITCHES Closing Inventory (in Units)	ROUTERS SX III Closing Inventory (in Units)
Jan 2009	3500	7000	5000	7800
Feb 2009	1000	4300	5100	7000
Mar 2009	6000	6700	6000	3600
Apr 2009	5000	2700	3500	1000
May 2009	3500	4500	4000	4000
June 2009	4000	5600	4000	5000
July 2009	4500	1000	2700	3800
Aug 2009	1000	5000	3600	1000
Sept 2009	1500	7800	2400	3700
Oct 2009	1000	3900	3700	2600
Nov 2009	2000	4500	1000	1400
Dec 2009	2400	700	1000	2000

Compiled by the author

Exhibit IX has the Sales Figure for 2009 for NI.

Exhibit IX: Monthly Sales figure (2009)				
Month	**ROUTERS RX III Closing Inventory (in Units)**	**VIDEO CONFERENCING UNIT Closing Inventory (in Units)**	**SWITCHES Closing Inventory (in Units)**	**ROUTERS SX III Closing Inventory (in Units)**
Jan 2009	7000	1000	3000	2000
Feb 2009	4000	3000	2100	3000
Mar 2009	3000	6000	3000	4000
Apr 2009	2500	5000	3700	3000
May 2009	3000	2000	7000	2000
June 2009	4000	3400	3000	7000
July 2009	3000	6000	1300	3000
Aug 2009	10000	3000	4000	3000
Sept 2009	2000	3000	2500	2000
Oct 2009	4900	5000	3100	2700
Nov 2009	3700	4700	3000	1700
Dec 2009	3000	5000	1000	2200
Compiled by the author				

Exhibit X has the split of orders from each market in Europe.

Exhibit X: Split of Orders from Each Market in Europe (2009) (in %)				
Market	**Sales Order for Routers RX III**	**Sales Order for Video Conferencing Unit**	**Sales Order for Switches**	**Sales Order for Routers SX III**
Amsterdam	20	10	10	20
London	10	30	20	20
Paris	20	20	10	NA
Stockholm	NA	NA	10	10
Kiev	20	15	10	20
Moscow	10	10	20	20
Rome	10	15	10	NA
Helsinki	10	NA	10	10
Compiled by the author				

Exhibit XI has the Manufacturing Costs.

Exhibit XI: Manufacturing Costs (2009)				
Contract Manufacturers	**ROUTERS RX III (per Unit in €)**	**ROUTERS SX III (per Unit in €)**	**VIDEO CONFERENCING UNIT (per Unit in €)**	**SWITCHES (per Unit in €)**
Moxconn	50	100	300	150
Virat	55	110	310	140
Lestica	52	110	305	155
Finpul	60	120	320	160
Compiled by the author				

Michael has the following questions to answer:

I. Should Michael open a new warehouse at London and close the one in Amsterdam? Should he open the London warehouse and operate both Amsterdam and London? Should he continue as is? He has the option of either selling the Amsterdam warehouse for €10000 or rent it for €2000 per month.

II. What should be Michael's mix of Contract manufacturers? How much should he source from each contract manufacturer? Should he consider the fourth manufacture and drop one? Should he continue with all four manufacturers?

III. How much should Michael buy from contract manufacturer per month to achieve a tradeoff between ordering cost, transportation cost and storage cost? What is the inventory he should hold?

IV. How should Michael forecast his sales and hence arrive at his inventory storage figures?

V. Should Michael drop any product from the portfolio?

