

Nexus Suppliers and Nexus Supplier Index (NSI)

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Overview

- Nexus suppliers as a new type of critical supplier
- Case Study from Honda
 - Mapping of a supply network
 - Application of network analysis
- Nexus Supplier Index (NSI)
 - Theoretically
 - In real world
- Results and Observations
- Other recent CAPS Research focus studies projects

Nexus Suppliers Defined

- Critical suppliers due to their structural position in the network
 - Exist anywhere in the network
 - Show specific mathematical properties.
- The buying firm:
 - May not have a visual on them
 - May not yet be aware of their criticality

Comparing a Strategic and Nexus Supplier

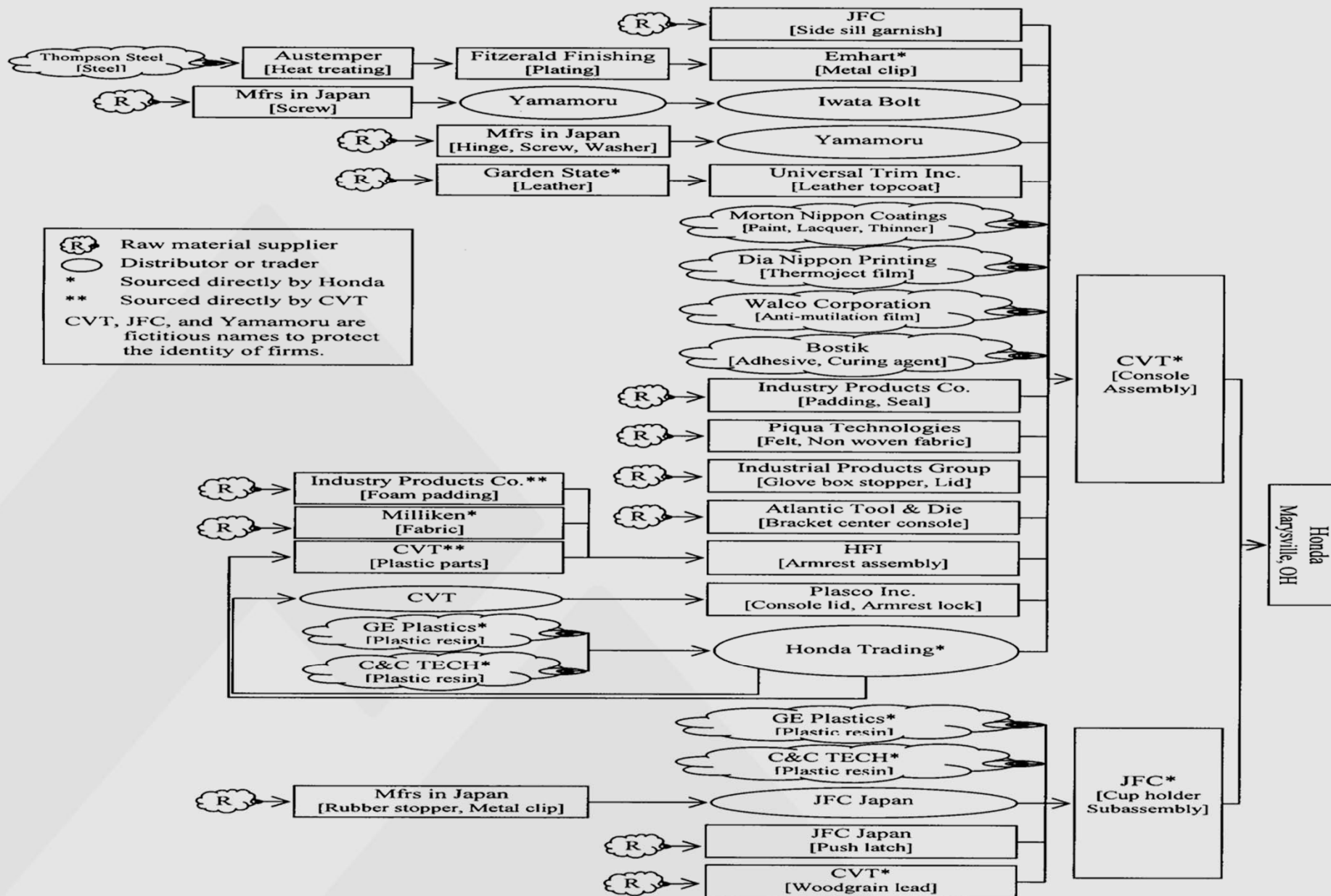
	Strategic Supplier	Nexus Supplier
Tier in the supply network	Top-tier	Any tier
Visibility to the focal buying firm	Visible	Not necessarily visible
Profit impact	High and direct	Potentially high and indirect
Mutual dependence	High and direct	Potentially high and indirect
Ideal relationship with the focal buying firm	Close	Not necessarily close
Sources of value	Superior internal capabilities and resources	Unique positions in inter-organizational networks

Honda Study

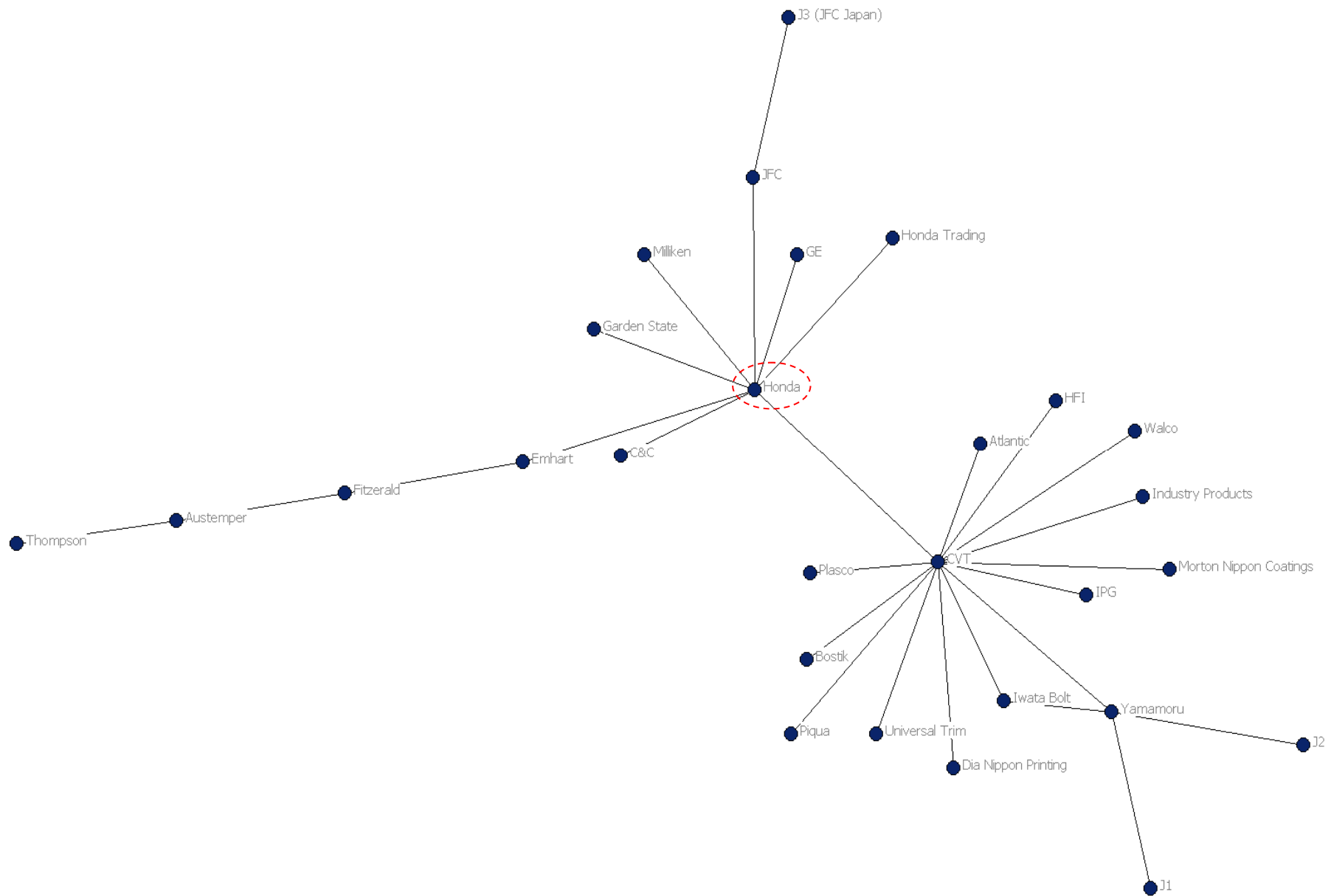
HONDA
The Power of Dreams

Honda Center Console Supply Map: A “Tree-Like” Structure

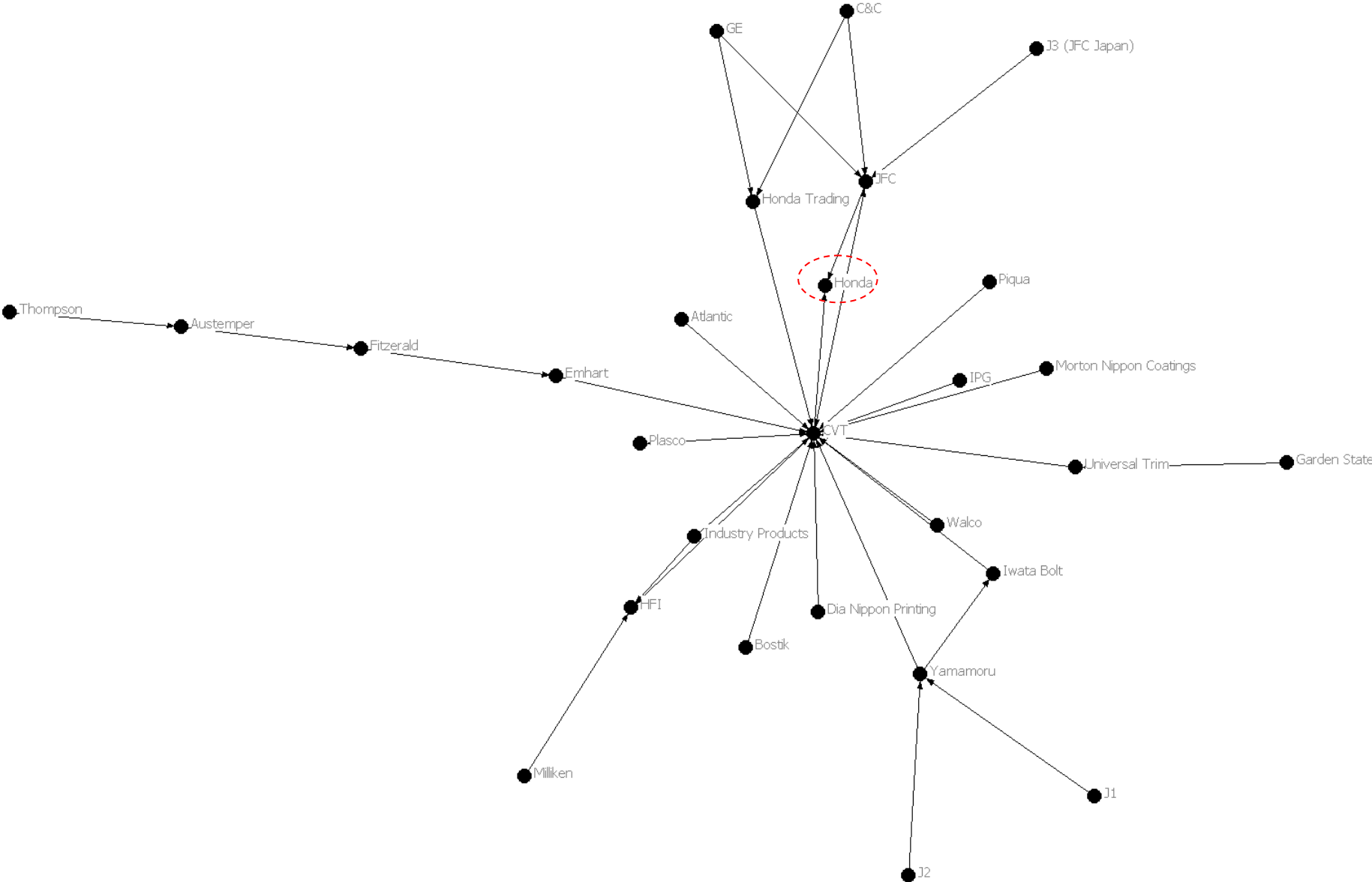
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Contractual Relationship “Network”



Materials Flow “Network”



Various Forms of “Centrality” Measures

List of key firms based on contractual relationships SN

Influential Scope ¹	Informational Independence ²	Relational Mediation ³
CVT (52), Honda (30), Yamamoru (15)	CVT (57), Honda (53), Yamamoru (40)	CVT (79), Honda (64), Emhart (21) Yamamoru (15), Fitzgerald (14)

¹ Firms with degree > 15

² Firms with closeness > 40

³ Firms with betweenness > 10

List of key firms based on materials flow SN

Supply Load ¹	Demand Load ²	Operational Criticality ³
CVT (59 ⁴), JFC (15), HFI (11)	CVT (15), C&C (7.4), JFC (7.4), GE (7.4), Yamamoru (7.4), Industry Products (7.4)	CVT (13), Emhart (2), Yamamoru (1.7), Fitzgerald (1.7), JFC (1.3)

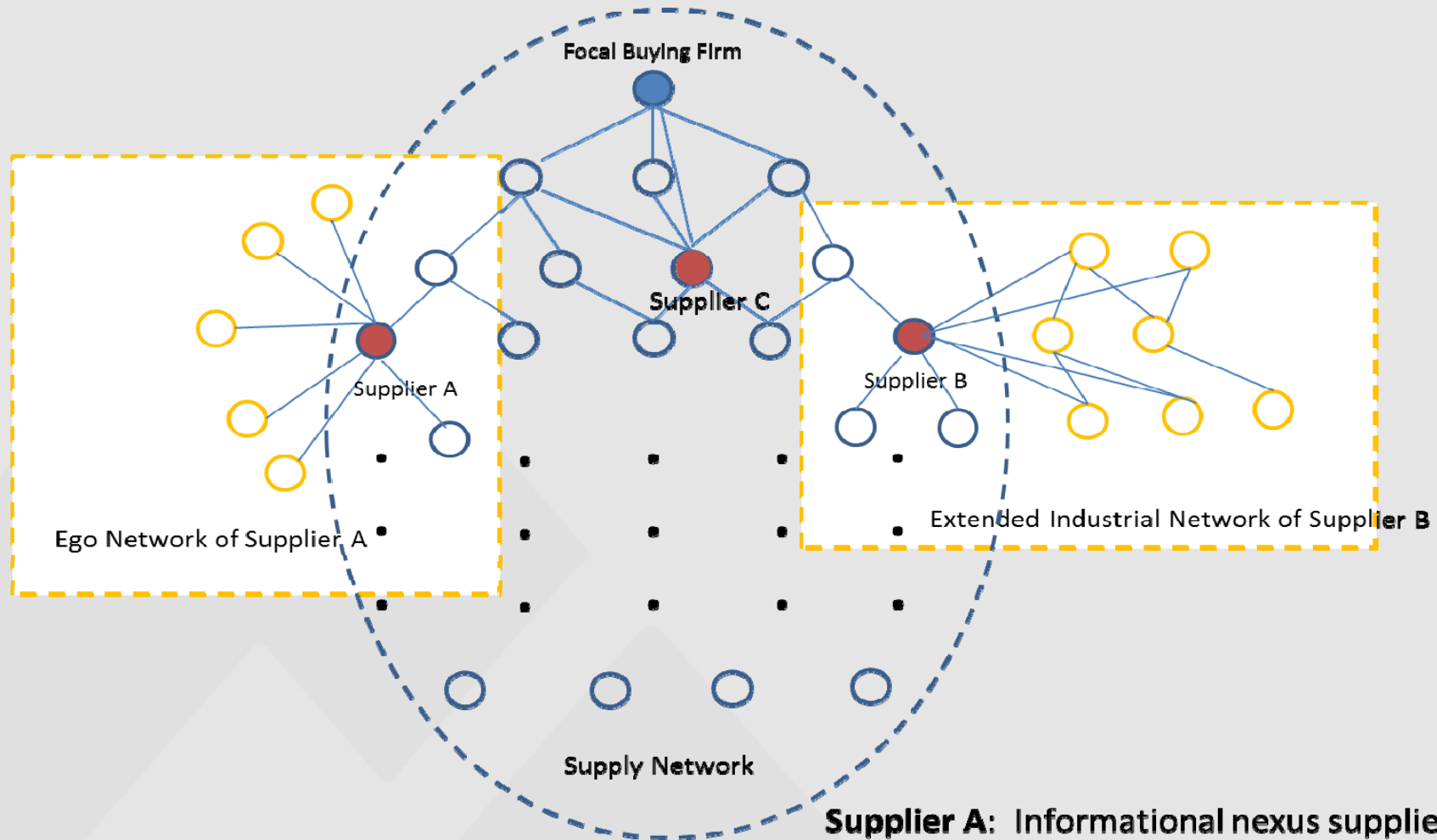
¹ Firms with in-degree > 10

² Firms with out-degree > 6

³ Firms with betweenness > 1.0

⁴ Centrality score

Nexus Suppliers Proposed



Supplier A: Informational nexus supplier
Supplier B: Monopolistic nexus supplier
Supplier C: Operational nexus supplier

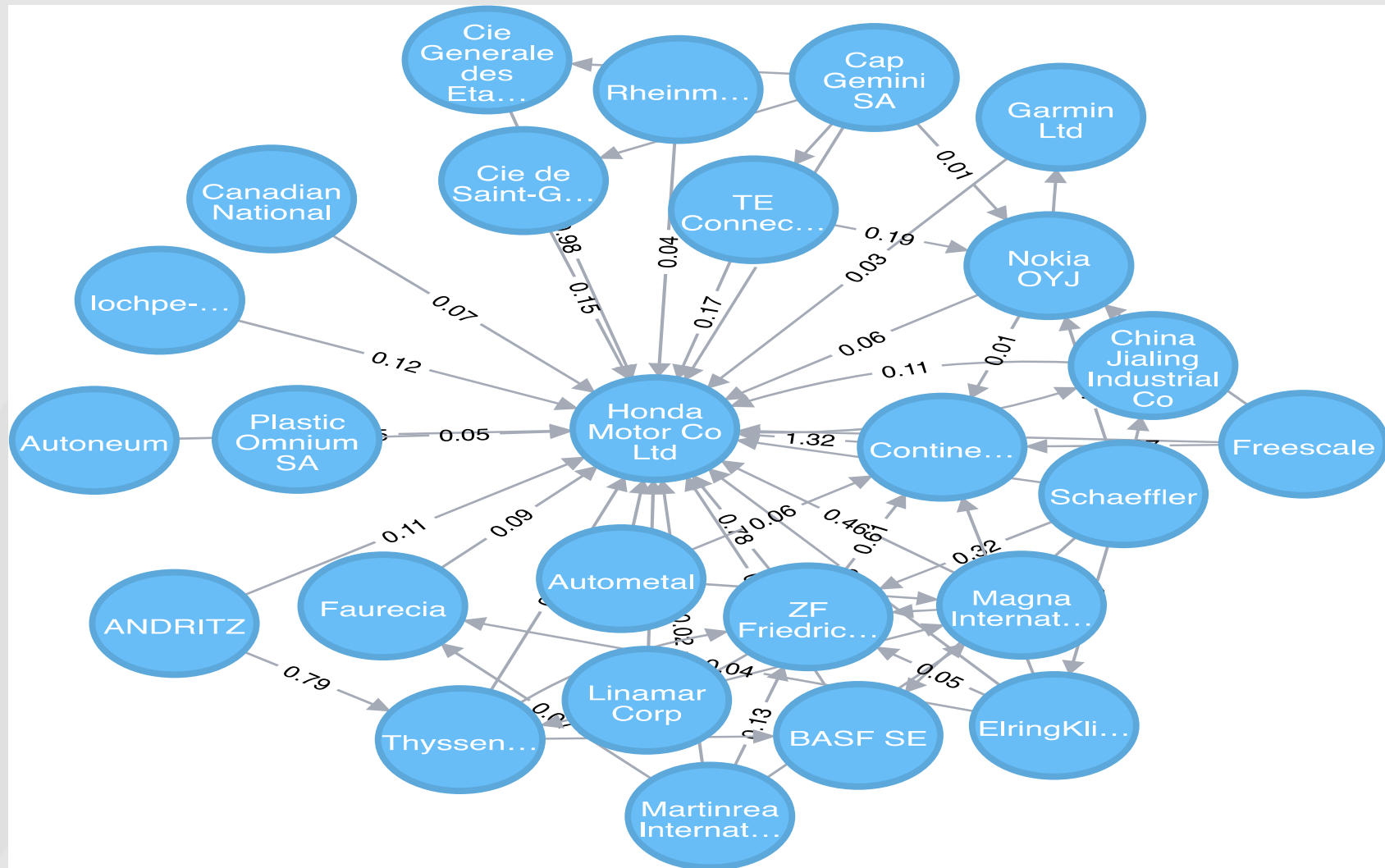
Bloomberg SPLC Database

- About 28,000 public firms worldwide
- Each firm's suppliers and customers (using information from company filings, industry reports, news articles, etc.)
- Value of relationship as a percentage of cost (or revenue)
- Firm-level data

Honda's SN as an Example: A “Tree-Like” Structure

- Total count to fourth tier: 10,832 suppliers
- First tier: 245
- Second tier: 1,643
- Third tier: 4,605
- Fourth tier: 4,339

A Tiny Part of the “Network”



The Whole “**Network**”: Only Three Tiers Deep



Nexus Supplier Index

$$\text{Maximize } NSI_p = \frac{\alpha D_p + \beta B_p + \gamma V_p}{\sigma F_p} \quad (1)$$

$$\text{subject to } \frac{\alpha D_i + \beta B_i + \gamma V_i}{\sigma F_i} \leq 1 \quad (i = 1, \dots, N) \quad (2)$$

$$\alpha, \beta, \gamma, \sigma \geq 0 \quad (3)$$

where D is degree **centrality**, B is betweenness **centrality**, V is eigenvector **centrality**, and F is distance farness measure.

Top 50 NSI's from 2nd and 3rd Tiers

Rank	Name	Tier	NSI
1	Siemens AG	2	1.0000
2	SAP SE	2	0.9711
3	Hewlett-Packard Co	2	0.9701
4	General Electric Co	2	0.9657
5	Samsung Electronics Co Ltd	2	0.9598
6	Microsoft Corp	2	0.9327
7	LG Electronics Inc	2	0.9319
8	Apple Inc	3	0.9267
9	Ford Motor Co	2	0.9263
10	General Motors Co	2	0.9229
11	Intel Corp	2	0.9209
12	Toyota Motor Corp	2	0.9199
13	Accenture PLC	2	0.9168
14	Akzo Nobel NV	2	0.9135
15	Sony Corp	3	0.9132
16	Flextronics International Ltd	2	0.9132
17	Infineon Technologies AG	2	0.9130
18	Zebra Technologies Corp	2	0.9119
19	Volkswagen AG	2	0.9119
20	Fujitsu Ltd	2	0.9111
21	VeriSign Inc	2	0.9100
22	ANSYS Inc	2	0.9097
23	ABB Ltd	2	0.9052
24	Linde AG	2	0.9012
25	Honeywell International Inc	2	0.9002
26	Amazon.com Inc	3	0.8998
27	Silicon Laboratories Inc	2	0.8977
28	Texas Instruments Inc	2	0.8976
29	Bayerische Motoren Werke AG	3	0.8969
30	Dow Chemical Co/The	2	0.8955
31	ON Semiconductor Corp	2	0.8954
32	BT Group PLC	2	0.8953
33	Daimler AG	2	0.8946
34	Ingram Micro Inc	2	0.8938
35	Cisco Systems Inc	2	0.8934
36	Nissan Motor Co Ltd	2	0.8922
37	Telefonaktiebolaget LM Ericsson	2	0.8915
38	Airbus Group NV	3	0.8910
39	Caterpillar Inc	2	0.8908
40	Arrow Electronics Inc	2	0.8907
41	Avago Technologies Ltd	2	0.8903
42	Vodafone Group PLC	2	0.8902
43	Atmel Corp	2	0.8901
44	Open Text Corp	2	0.8899
45	Adobe Systems Inc	2	0.8894
46	Avnet Inc	2	0.8856
47	Boeing Co/The	3	0.8844
48	Polycom Inc	2	0.8840
49	Fiat Chrysler Automobiles NV	3	0.8824
50	Danaher Corp	2	0.8820

Quote from a Honda Manager

“If we can glean one or two or 10 key hints on the list, these might be suppliers we need to dig into more, partner with, mitigate risk with; there is huge value to that.”

Initial Observations

- Blind spots
 - Monitor
 - A small contract and introduction to other suppliers
 - Supplier development
- VW in the second tier
- Apple in the third tier

Focus Studies Topics at CAPS Research

- Cloud-Services Outsourcing
- Nexus Supplier Index
- Supply Chain Financing
- Assessing Supplier's Innovation Potential
- Cognitive Procurement
- Cyber Security in Supply Base

**Any questions or
comments?**

Thank you!!