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**Addressing the Consensus on
Information Sharing in CPFR
Information Systems:
Insights from
Manufacturer–Retailer Dyads**

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In collaboration with

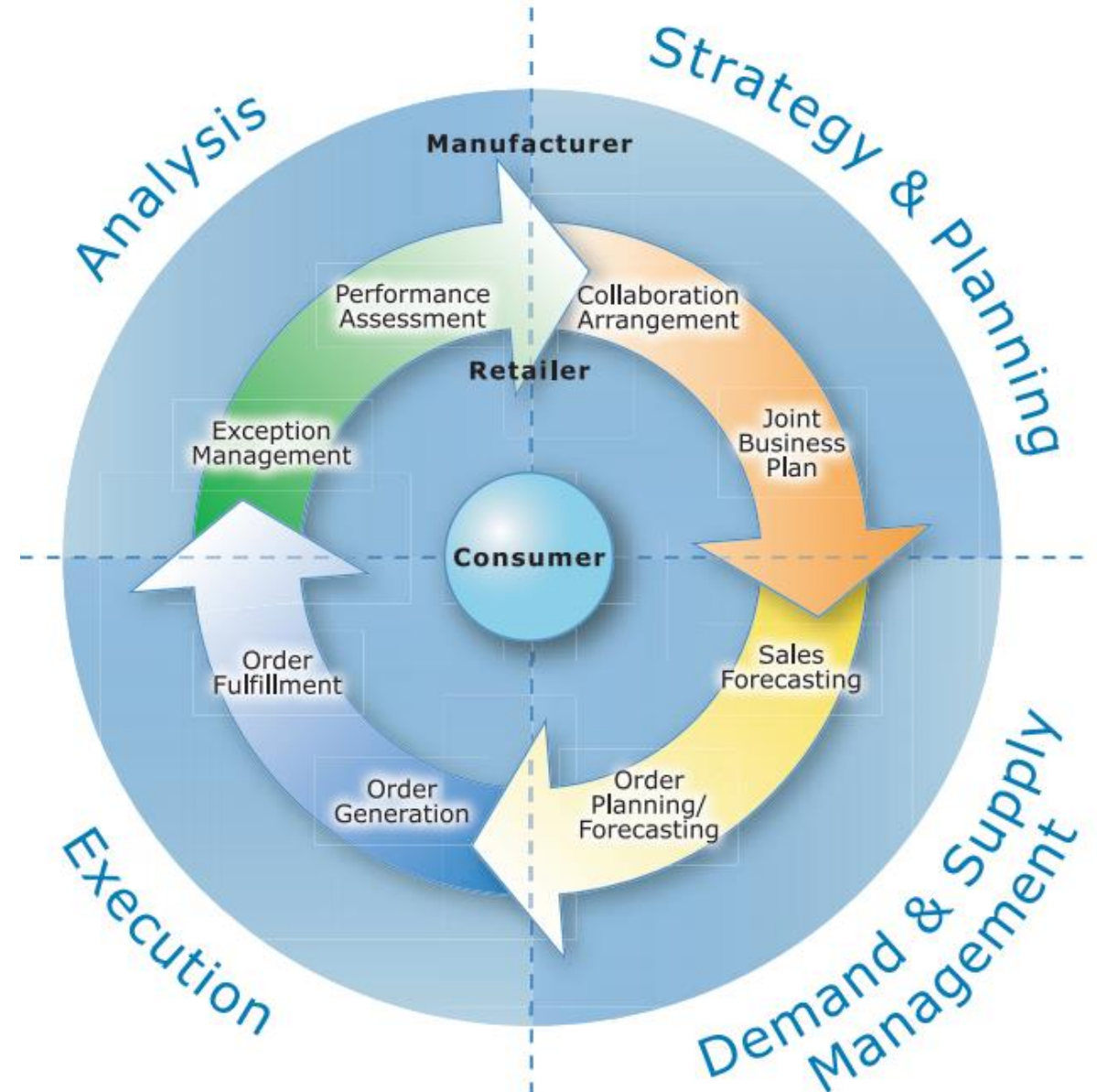
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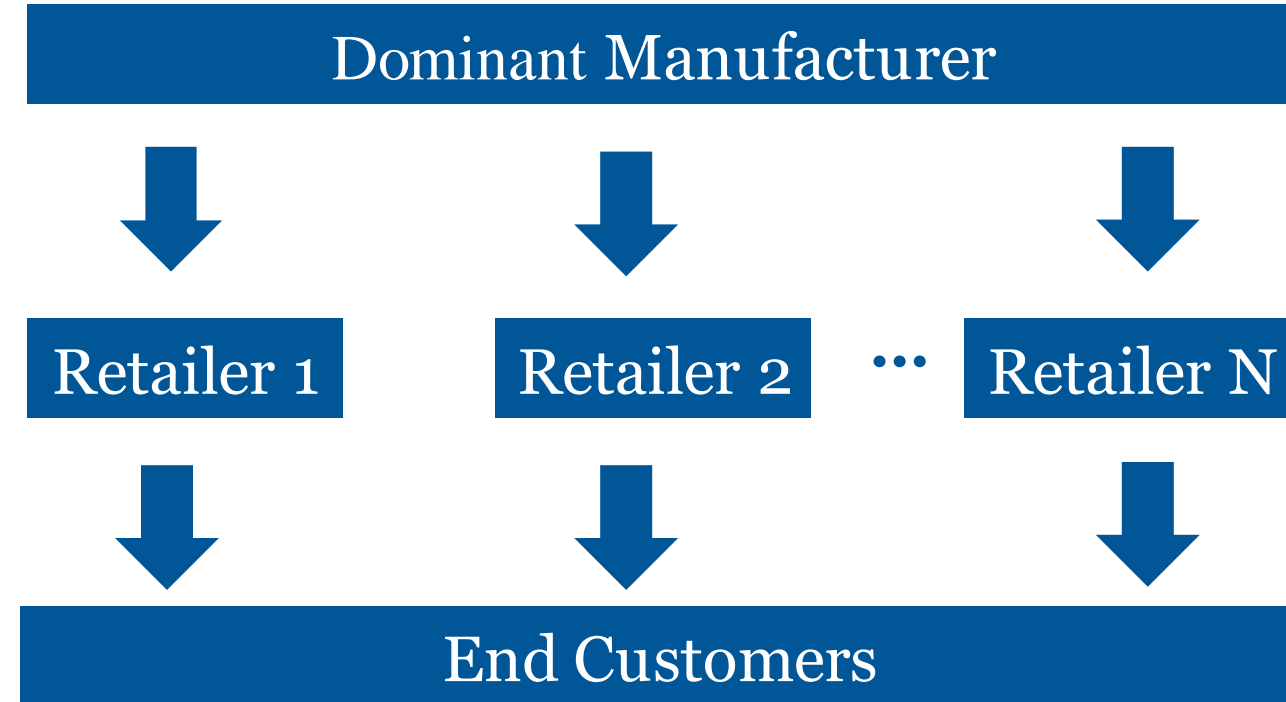


- Collaborative Planning, Forecasting, and Replenishment (CPFR) Systems
 - Developed by the Voluntary Inter-industry Commerce Solutions Association (VICS)
 - Target
 - A buyer and a seller work together to *satisfy the demands* of an end customer.
 - Examples
 - Walmart
 - Procter and Gamble (P&G)
 - Whirlpool Corporation
 - Sears
 - Michelin
 - Features
 - Standardized *regulations*
 - Intensive *collaborations*





- Collaborative Planning, Forecasting, and Replenishment (CPFR) Systems
 - Facilitate the *flow of information* from downstream retailers to the dominant manufacturer
 - Optimize *scheduling, inventory, and transportation* in the supply chain (Kaipia et al. 2017)
 - Important to *encourage* retailers to *share valuable information* to enable success of CPFR (Fu 2016).





- Main problem in CPFR
 - Achieving the cognitive *consensus on information sharing* (Li et al. 2014)
 - Cognitive *discrepancy* (Mishra et al. 2007; Sari 2008; Shang et al. 2015)

Dominant Manufacturer

Retailers do not make enough efforts in sharing information sufficiently and accurately

Retailer

Substantial efforts have been made to share information

- Lack of consensus on evaluating information sharing eventually induces the *failure* of CPFR (Fu 2016; Michalski et al. 2018; Narayanan and Moritz 2015)
- Need to investigate the *factors* influencing the consensus on information sharing between the dominant manufacturer and its retailers



- Social Capital Theory (SCT)
 - A theoretical lens for explaining the mechanism that how firms are *socially embedded in networks of relationships* which incorporate a diverse set of organizational actors (Inkpen and Tsang 2005)
 - Social capital: *tangible and intangible resources* embedded within, available through, and derived from the network of relationships possessed by a firm
 - In CPFR, social capital is an indispensable asset *held by the dominant manufacturer* (Steinmo and Rasmussen 2018)
 - Three dimensions (Nahapiet and Ghoshal 1998)
 - Cognitive capital
 - Structural capital
 - Relational capital



- Social Capital Theory (SCT)
 - Cognitive capital
 - Shared *interpretations*, *meaning* and *understanding* among network members (Chiu et al. 2006; Lefebvre et al. 2016)
 - Consensus on information sharing as cognitive capital
 - Consensus is a commonly accepted opinion within a group
- Cognitive capital can be developed based on *structural capital* and *relational capital* which ensure communication linkage and relationship quality (Li et al. 2014)



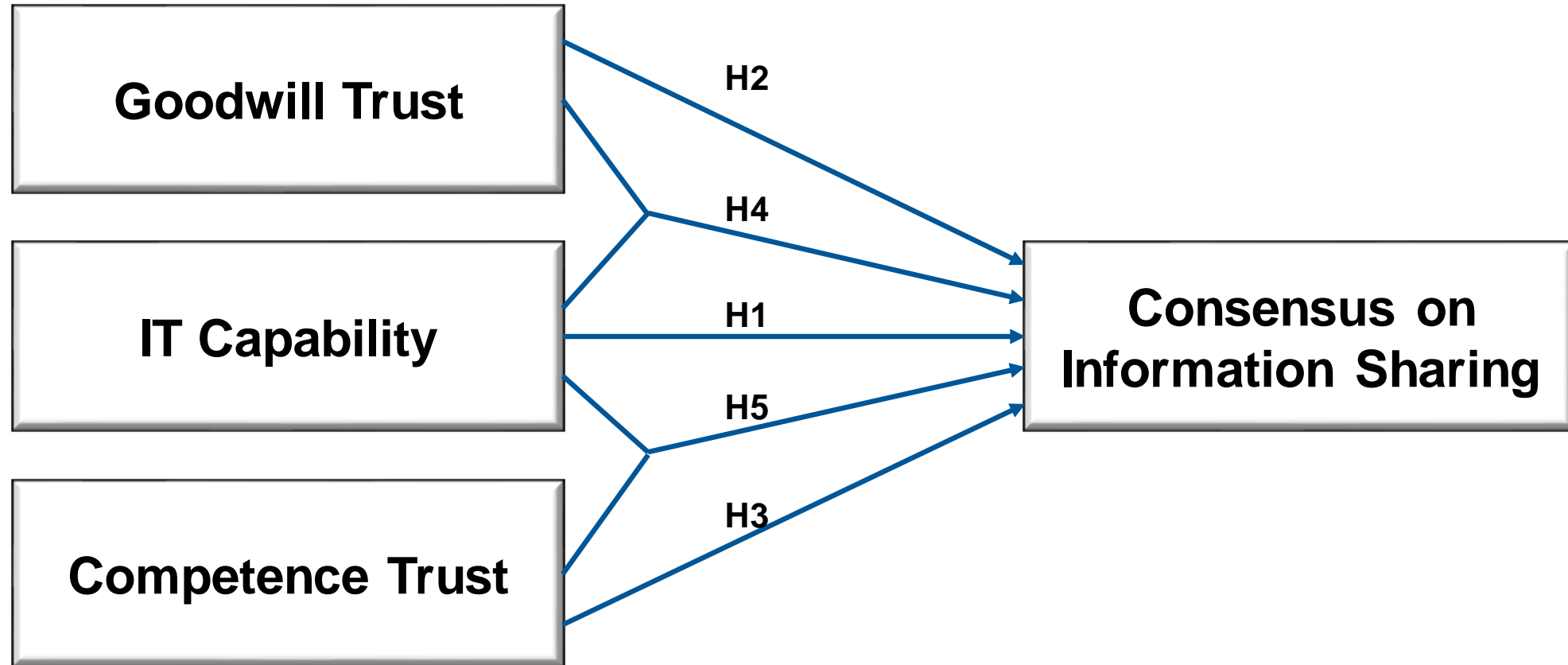
- Social Capital Theory (SCT)
 - Structural capital
 - Configuration and pattern of *connections* between network actors (Inkpen and Tsang 2005; Lefebvre et al. 2016; Wagner et al. 2014)
 - IT capability as structural capital
 - IT capability is a firm's ability to acquire, deploy, combine, and reconfigure *IT resources* in support and enhancement of *business strategies* and *work processes* (Lu and Ramamurthy 2011).
 - IT capability supports manufacturer and retailer to *standardize, automatize, and integrate* their interaction and linkage (Cai et al. 2016; Prajogo and Olhager 2012; Yu et al. 2017)



- Social Capital Theory (SCT)
 - Relational capital
 - Assets created and leveraged through relationships, which reflects *trust*, *norms*, *obligations*, and *identifications* between organizational actors within a network system (Inkpen and Tsang 2005; Li et al. 2014; Nahapiet and Ghoshal 1998)
 - Trust as relational capital
 - Trust refers to one party's *positive expectations* regarding another party's motivations and/or actions in a *risky* exchange relationship (Cao and Lumineau 2015; Jiang et al. 2015).
 - It is widely acknowledged that trust is the *representative* of relational capital which reflects the quality of relationship (Nahapiet and Ghoshal 1998; Preston et al. 2017; Steinmo and Rasmussen 2018).



Research model with hypotheses





- A focal manufacturer “Company H” producing water heater in China
- A CPFR information system was adopted by Company H to collaborate with its *428 retailers* for saving inventory cost, reducing stock obsolescence risk, and fulfilling retailers’ needs for products.
- A *matched* questionnaire survey
 - Part A for retailers includes items measuring
 - IT capability
 - Trust in the manufacturer
 - Information sharing
 - Part B for the manufacturer (Company H)
 - Information sharing
- *259 matched questionnaires* out of 428 targeted manufacturer-retailer dyads, with a response rate of 60.514%



Research method

Table 1. Sample Demographic Information (n = 259)					
	N	Percentage		N	Percentage
Firm size			Firm age		
1: Less than 10	27	10.425%	1: Less than 1 year	10	3.861%
2: 10-50	99	38.224%	2: 1-3 years	35	13.514%
3: 51-75	31	11.969%	3: 4-6 years	54	20.849%
4: 76-100	28	10.811%	4: 7-10 years	75	28.958%
5: 101-150	22	8.494%	5: 11-15 years	42	16.216%
6: 151-200	15	5.792%	6: More than 15 years	43	16.602%
7: More than 200	37	14.286%	Number of employees in the IT department		
Sales proportion			1: < 2	154	59.460%
1: <20%	37	14.286%	2: 2-5	90	34.749%
2: 20%-40%	43	16.602%	3: 6-10	9	3.475%
3: 40%-60%	38	14.672%	4: 11-15	1	0.386%
4: 60%-80%	34	13.127%	5: More than 16	5	1.931%
5: 80%-100%	107	41.312%	Relationship length		
Number of customers			1: <5	113	43.629%
1: <10	29	11.197%	2: 5-10	98	37.838%
2: 10-100	141	54.440%	3: >10	48	18.533%
3: >100	89	34.363%			



- Measurement

- IT Capability [adjusted from Rai and Tang (2010)]

1. Our system easily accesses data from our manufacturer' systems.
2. Our system provides seamless connection between our manufacturer' systems and our systems (e.g., forecasting, production, manufacturing, shipment, etc.).
3. Our platform has the capability to exchange real-time information with our manufacturer.
4. Our systems easily aggregates relevant information from our manufacturer' databases (e.g., operating information, business customer performance, and cost information).
5. Our system is easily adapted to include new partners.
6. Our system can be easily extended to accommodate new applications or functions.
7. Our system employs standards that are accepted by most current and potential partners for this product line.
8. Our system consists of modular software components, most of which can be reused in other business applications.



- Measurement

- Goodwill Trust [adjusted from Liu et al. (2008)]

1. We believe manufacturer will be ready and willing to offer us assistance and support.
2. We believe manufacturer is concerned about our welfare when making important decisions.
3. We believe manufacturer is dependable when it comes things which are important to us.
4. We believe manufacturer can be counted on by us in the future regarding to its decisions and actions, which will not hurt our interests.
5. We believe manufacturer will understand and respond to the questions we share with them.

- Competence Trust [adjusted from Liu et al. (2008)]

1. Manufacturer is capable of shortening the lead time.
2. Manufacturer is capable of improving delivery speed and reliability.
3. Manufacturer is capable of ensuring product quality.
4. Manufacturer is capable of keeping the promise they made to us.



- Measurement
 - Retailer's Information sharing with Manufacturer [adjusted from Huo et al. (2014)]
 1. We share our sales plans with manufacturer.
 2. We share our demand forecasts with manufacturer.
 3. We share our inventory levels with manufacturer.
 - Manufacturer's Perception of Retailer's Information Sharing [adjusted from Huo et al. (2014)]
 1. The retailer shares its sales plans with us.
 2. The retailer shares its demand forecasts with us.
 3. The retailer shares its inventory levels with us.



- Operationalization of the consensus on information sharing
 - Degree-symmetric model (Klein et al. 2007; Straub et al. 2004)
 - Capture the consensus of constructs by assessing *degree* and *symmetry* using dyadic data

Derivations	Definition	Formula	Assumptions
Degree value: DV_a	Summated index of the client and vendor values of the construct, a	$(CV_a + VV_a)/2$	$0 < DV_a \leq 1$
Symmetry value: SV_a	Calculated as the symmetry index of construct, a , within the client–vendor relationship.	If $CV_a \geq VV_a$, then $SV_a = VV_a/CV_a$; or If $CV_a < VV_a$, then $SV_a = CV_a/VV_a$	$0 < SV_a \leq 1$
Degree of symmetry value: DSV_a	Calculated as the index of both symmetry and value of construct, a , within the client–vendor relationship.	$(DV_a + SV_a)/2$	$0 < DSV_a \leq 1$



Analytical results

Table 2. Means, Standard Deviation, and Correlations

Constructs	Means	SD	1	2	3	4	5	6	7	8
1.RL	NA	NA	NA							
2.NEITD	NA	NA	0.017	NA						
3.FS	NA	NA	0.332**	0.400**	NA					
4.FA	NA	NA	0.497**	0.251**	0.472**	NA				
5.ITC	3.781	0.831	-0.119	0.096	-0.031	-0.008	0.795			
6.GWT	4.385	0.659	-0.137*	0.104	-0.039	-0.013	0.447**	0.822		
7.CPT	4.388	0.646	-0.145*	0.047	0.015	-0.064	0.472**	0.563**	0.749	
8.CIS	NA	NA	-0.099	-0.054	-0.074	-0.118	0.359**	0.429**	0.457**	NA

- Note: Numbers in diagonal are square roots of the corresponding construct, * shows significance at the 0.05 level, and ** shows significance at the 0.01 level, ***shows significance at the 0.001 level.
- RL: Relationship Length NEITD: Number of employees in IT department FS: Firm Size FA: Firm Age ITC: IT Capability GWT: Goodwill Trust CPT: Competence Trust CIS: Consensus on Information Sharing

Table 3. Reliability and Validity

Constructs	Items	Loading	Cronbach's α	Composite reliability	AVE
IT Capability	8	0.734– 0.867	0.935	0.932	0.632
Goodwill Trust	5	0.745 – 0.875	0.926	0.912	0.675
Competence Trust	4	0.642 – 0.874	0.857	0.835	0.561
Retailer's Information Sharing	3	0.721 – 0.810	0.792	0.799	0.570
Manufacturer's Perception of Retailer's Information Sharing	3	0.785 – 0.893	0.784	0.871	0.693

Note: AVE = Average Variance Extracted



Table 4. Results of Regression Analysis

Independent Variable	Dependent Variable: Consensus on Information Sharing		
	Model 1	Model 2	Model 3
LENGTH	-0.057	0.036	0.018
NEITD	-0.031	-0.081	-0.083
SIZE	-0.005	0.000	-0.004
AGE	-0.080	-0.095	-0.083
ITC		0.144*	0.134*
GWT		0.228**	0.203**
CPT		0.264***	0.291***
ITC*GWT			-0.186**
ITC*CPT			0.110*
R ²	0.017	0.282	0.312
Adj-R ²	0.002	0.262	0.287
F	1.107	14.085***	12.563***

Note:

- * shows significance at the 0.05 level, and ** shows significance at the 0.01 level, *** shows significance at the 0.001 level.
- RL: Relationship Length NEITD : Number of Employees in IT Department FS: Firm Size FA: Firm Age ITC: IT Capability
GWT: Goodwill Trust CPT: Competence Trust

- H1, H2, H3, and H5 were supported
- H4 was rejected



Theoretical implications

- Enrich the CPFR research by investigating the *cognitive consensus between manufacturer and retailer*
- Contribute to the information sharing literature by adopting *a dyadic perspective* to conceptualize and measure the consensus between sender and recipient, which address the call for exploration beyond the monadic perspective (Li et al. 2014)
- Extend the research on consensus on information sharing to the CPFR context by identifying *IT capability* and *trust* as antecedents of consensus on information sharing based on the SCT



Practical implications

- We encourage the dominant manufacturer to help retailers develop their *IT capability* to better clarify information needs and exchange opinions.
- We suggest the dominant manufacturer managers to invest time and efforts to cultivate *goodwill and competence trust* with retailers in CPFAR in order to reach consensus on evaluating information sharing.
- When there is a need to balance the development of goodwill and competence trust, this study recommend to *prioritize competence trust* because it works with IT capability to attain additional influence on information sharing consensus.



- Generalizability
 - A *specific context* of CPFR with one dominant manufacturer and multiple retailers
- Measurement
 - Subjective data from *survey*
- More moderators to be explored
 - Organizational culture
 - Retailer dependence on manufacturer
 - Power of manufacturer



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