

2002

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Mickey Howard

*School of Management, University of Bath, mnsmbh@management.bath.ac.uk*

Richard Vidgen

*School of Management, University of Bath*

Philip Powell

*School of Management, University of Bath*

Andrew Graves

*School of Management, University of Bath*

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## Recommended Citation

Howard, Mickey; Vidgen, Richard; Powell, Philip; and Graves, Andrew, "Are Hubs the Centre of Things? eProcurement in the Automotive Industry" (2002). *ECIS 2002 Proceedings*. 77.

<http://aisel.aisnet.org/ecis2002/77>

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# ARE HUBS THE CENTRE OF THINGS? E-PROCUREMENT IN THE AUTOMOTIVE INDUSTRY

Mickey Howard, Richard Vidgen, Philip Powell and Andrew Graves

School of Management  
University of Bath, Bath BA2 7AY, United Kingdom  
e-mail: mnsmbh@management.bath.ac.uk

## ABSTRACT

*Organizations are being confused by simplistic, technology-driven models of e-business that allegedly enhance competitive and co-operative capability. Re-examining the perceived wisdom of electronic markets finds shallow, overlapping networks competing for membership, isolated pockets of collaboration and irregular flows of revenue, resembling an ad-hoc arrangement of spokes rather than a hub structure. This paper develops a classification that highlights the link between inclusive/exclusive hub membership and the buyer-supplier relationship as part of planning e-procurement strategy. Three automotive case studies show that introducing electronic hubs without IS-related, industry-level planning simply speeds up the mess.*

## 1. INTRODUCTION

The rise of the Internet and the rapid spread of electronic procurement (EP) across world markets have left few industries unchanged. Since its inception in the early, 1990s e-commerce has been feted by world markets seeking new solutions to business models and dramatic reductions in transaction costs (Timmers 1998). While initially acclaimed for re-structuring old-world economies and enabling inter-organisation collaboration, e-commerce has endured the ignominy of a dotcom crash and has been increasingly criticised for failing to deliver value (Boot and Butler 2001). This is particularly the case in the auto industry, whose old economy origins, IT legacy systems and complex, hierarchical supply chains mean IS-related transformation is more difficult than, for instance, grocery retailing. Intense competition and slim margins in volume passenger vehicle manufacturing in Europe and N. America has claimed a victim in the resignation of Jac Nasser, Ford CEO and ardent supporter of e-commerce.

The 2000 launch of 'Covisint', the biggest and most powerful business-to-business e-marketplace was heralded as the beginning of a 'new era' in auto purchasing and supply chain management. Founder members Ford, GM and DaimlerChrysler anticipated significant component price reductions and customer responsiveness by combining economies of scale and Internet technology. However, rival vehicle manufacturers (VMs) and component suppliers were already developing their own solutions and were reluctant to subscribe over fears of accepting a subordinate role. As private trade exchanges, or *hubs*, proliferated, Covisint's vision to offer collaborative procurement, lower transaction costs and the introduction of a universal system standard, began to diminish (Kisiel and Whitbread 2000).

This paper investigates the impact of EP on industry structure. It examines electronic markets in the auto industry and develops a typology that captures the collaborative versus commoditised nature of procurement hubs, building on horizontal and vertical supply relationship research. In order to examine the phenomenon in depth, it is necessary to identify the expected and realised benefits of hubs, and the IS-related barriers to change. Rather than simply describing EP systems as they currently are, the paper combines a historical perspective with three cases that focus on their competitive

characteristics and interaction in the business-to-business (B2B) marketplace (Kaplan and Sawhney 2000). While web-enabled technology has become assimilated into many areas, neither the means for effective deployment nor their impact on industry structure, are well understood.

Section two examines procurement systems which use the electronic hub as the principle method of trade exchange, despite increasing complexity that is prone to intra and inter-organisational barriers. Section three describes the emergence and proliferation of electronic markets in the auto industry. Section four outlines the research method. Section five describes the automotive cases that are analysed in section six. Section seven addresses the implications for management and research.

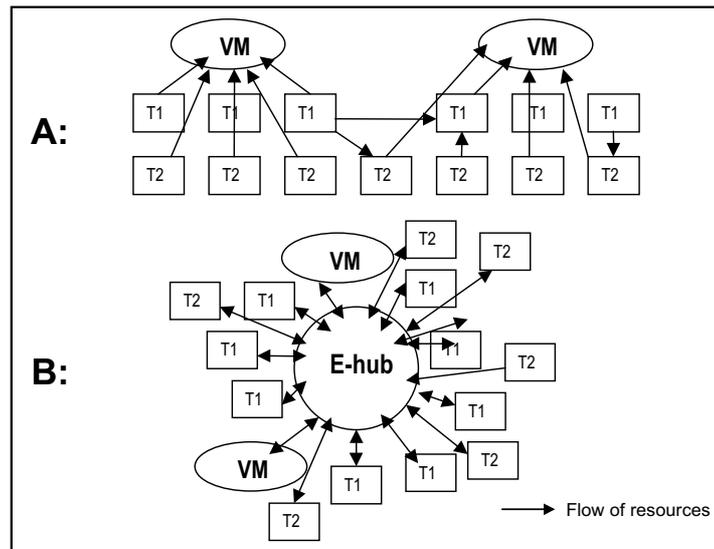
## **2. FROM BESPOKE EDI TO GENERIC EP**

E-procurement is electronic buying, selling and tendering of goods and services (Timmers 1998). It is a subset of E-commerce and has existed for over 20 years in the forms of EDI, CAD, and Computer Assisted Lifecycle Support (CALs). EP is concerned with buy-side electronic markets, focusing on procurement, supply chain management and product development. A sell-side market focuses on demand. This paper examines vertical and horizontal, buy-side electronic markets.

Traditional EDI originated from firms wishing to automate data exchange internally and with partners. It is a bespoke, secure link between firms offering a reliable means of communicating purchase orders, build schedules and forecasts. However, integration of EDI faced a number of difficulties in the auto industry: high entry costs, proliferation of standards and coercive pressures from powerful VMs. For instance, firms using EDI found themselves tied into a technology that merely replicated the hierarchical nature of traditional, adversarial customer-supplier relationships. Ford had a basic objective in developing its EDI network 'Fordnet' in the mid-80s: to gain competitive advantage by locking its suppliers and customers into its systems, and locking its competitors out (Webster 1995).

E-commerce differs from EDI as it provides an inter-organizational IS that fosters market-based exchanges between agents in all transaction phases (Bakos 1997). A major advance in procurement is web-enabled technology that uses the Internet for low cost, real-time information exchange with multiple partners. This enables a suite of online activities: product development, procurement, and operations planning and scheduling. E-commerce offers online development using 'virtual spaces' in which manufacturers and suppliers collaborate. Therefore its potential benefits are not solely transaction cost, but enabling buyer/supplier partnerships and new product collaboration. The emergence of Web-EDI in the late 90s, offered a simple, low cost solution for firms seeking connection to partners via the Internet using PCs. This explosion in world-wide connectivity enables the emergence of online trade exchanges, or e-hubs.

E-hubs provide a virtual marketplace. The term e-hub here covers 'portal', Internet trade exchange or B2B electronic marketplace. Their appeal is clear: by bringing together huge numbers of buyers and sellers, and automating transactions, e-hubs expand choice available to buyers, give sellers access to new customers, and reduce transaction costs (Kaplan and Sawhney 2000). By extracting fees for the transactions, hub operators earn revenue. Hubs represent a recent and fast developing phenomenon in e-markets where even industry stalwarts like GM and Ford are participating. However, this paper argues that the impact of the e-hub on traditional supply chains, in terms of the nature of the change to auto industry structure that occurs between buyer/supplier and supplier/supplier transactions, is not fully appreciated (Figure 1). The literature suggests that VMs and component suppliers (T1 and T2) shift from a hierarchical top-down structure, where resources flow to the VM (A), towards a centrally aligned hub structure providing both an online marketplace and a one-stop communication point for commercial trading and new product collaboration (B) (Graves and Warburton 2000). This is an oversimplification of the role of electronic markets that ignores the fundamental conflict of interest between procurement systems focusing on price, and those fostering supply chain collaboration.



**Figure 1** Auto supply structure: suggested e-hubs impact (Adapted: Graves & Warburton 2000)

## 2.1 E-market classification

E-markets are classified in terms of *what* they buy, e.g. products and services, and *how* they buy it, e.g. systematic sourcing and negotiated contracts, or spot sourcing and commodity trading. Firms can either engage in systematic sourcing or in spot trading. System sourcing involves negotiated contracts with qualified suppliers, involving long-term contracts and close relationships between buyers and sellers. In spot sourcing the buyer's goal is to fulfil an immediate need at the lowest cost, such as commodity trading for oil and steel (Kaplan and Sawhney 2000).

In their description of 'governance structures of e-markets', Baldi and Borgman (2001) consider two dimensions to be of particular importance. First, *the role of the owner* - an active market participant or an independent third party. Second, *the competitive relation of the owners* - may be direct competitors outside this venture. This results in four ownership structures for electronic markets:

- A *private trade exchange* is owned and operated by a single firm.
- A *third party exchange* is owned by a non-competing individual or group of companies.
- A *consortium trade exchange* has shared ownership by firms competing outside the e-market.
- A *meta market* is formed by a group of independent market providers who collaborate and exchange requests and offers by interconnecting their market plans to increase liquidity.

The focus of the e-market is the hub, or point of exchange for goods and services. A horizontal market (or hub) addresses a specific function and can serve a wide range of industries, while a vertical one focuses on a broad range of functionality in a specific industry (Kaplan and Sawhney 2000).

Auto firms are setting up e-hubs for procurement and product development, either privately or as consortia. The largest consortium trade exchange is Covisint (members includes Ford, GM, DaimlerChrysler, Renault Nissan and Peugeot Citroen). Literature suggests that the consortium trade exchange represent a horizontal model of e-procurement, that excludes Tier 1 and 2 component suppliers from participating as equal partners, because they are not being offered shares in the venture. Suppliers are sceptical of win-win promises because they fear their profit margins will be slashed through Internet auctions and their products commoditised. Increasingly, other types of exchange are emerging; for instance private procurement hubs such as those owned by BMW and Volkswagen who rejected offers to join Covisint. While this offers the advantage of tailoring EP in line with specific VM needs and an alternative in the event Covisint fails (Baldi and Borgman 2001), it also threatens to increase the burgeoning number of IT standards and protocols in the auto supply chain. Literature

suggests that private trade exchanges represent a vertical model, where private ownership by individual VMs allows the integration of selected suppliers within privately owned supply networks.

While, in theory, consortium trade exchanges offer connectivity and system standardisation requirements, they do not overcome the reluctance of suppliers to fully participate in e-hubs with more powerful members such as VMs. Only if mutual benefits exist for all players: customer, dealer, vehicle manufacturer, supplier and logistic firm, will one e-hub dominate. Thus, this paper proposes that current auto industry e-markets do not resemble the unilateral structure suggested by figure 1.

## 2.2 E-procurement and the barriers to change

The planning, implementation and maintenance of e-procurement represents a considerable challenge (Huber et al 2000). Planning for IS-related change requires clear strategic objectives and a systematic means of identifying project constraints, barriers or features, that if not addressed, may hinder change (Kwon and Zmud 1987, Earl 1994). This is particularly significant for the volatile e-commerce environment and the legacy systems in the auto industry (Howard et al 2001). A starting point is the Barriers Information Framework that has four categories, classified as structural, managerial, user and technical and operates at the level of the individual organization to consider impediments to IS-related change (Kirveennummi et al 1998). In looking at e-Government, Heeks and Davies (2001) identify a range of barriers to integration of services: skills and knowledge; finance; risk; suspicion; infrastructure; and data quality. More generically, Heeks and Davies categorize these barriers as structural and cultural, political, and technical. They also point out that barriers exist between organizations as well as within, the chief of which are trust and power-related aspects of information sharing. In table 1 this is synthesized to create an Industry Transformation Barriers (ITB) framework that addresses organizational and inter-organizational (industry) issues of IS-related change.

The industry-level (inter-organizational) barriers are structural and political. Structural aspects include competitive, monopolistic and anti-trust issues. As e-markets proliferate, increased competition is likely to destroy some hubs, leading to consolidation. Gartner estimates there will be room for only three vertical portals in each industry (Huber et al 2000). Anti-trust is a particular problem in the US where Covisint was prevented from trading fully until after a federal enquiry. Limited competition such as monopoly or oligopoly represents a barrier to EP where the main force compelling sellers to conform to consumer wants and to hold prices near cost is not competition but *countervailing power* exercised by strong buyers (Scherer 1980). Therefore, it may be possible to explain the proliferation of e-hubs in the auto industry, through rival VMs and supplier groups attempting to offset the power of Covisint by forming consortia or supply partnerships, and launching exchange systems of their own. The political barrier represents these power-related aspects – who wins, who loses?

Barrier (Intra-Org)	Indicative factors
Structural	Departmental hierarchy and decision-making structure Availability of financial resources Labour organizations
Cultural	Attitude to risk and uncertainty Openness to change
Managerial	Skills and knowledge (e.g., IT awareness, IT planning) Leadership Suspicion (e.g., loss of power and control)
User	Resistance Fear of change
Technical	Legacy systems Infrastructure (e.g., networks and standards) Data quality (e.g., inaccuracies, inconsistencies, incompleteness) IT capability (e.g., information management skills)
Barrier (Inter-Org)	Indicative factors
Structural	Anti-trust legislation Privacy and security
Political	Power Trust Attitude to information sharing

**Table 1** Industry transformation barriers (ITB) framework

### 3. DEVELOPMENT OF E-MARKETS IN THE AUTO INDUSTRY

A significant development in the automotive market 1999 was the simultaneous but independent announcement by Ford and GM that they were to launch B2B trade exchanges for supply and procurement throughout their supply chains. The exchanges started as US-based initiatives, but with the clear intention to expand them globally and encourage other VMs to join. The launches were heralded at the time as *'fundamentally changing the nature, structure and operation of the industry'* (Graves and Warburton, 2000), but were merged in February 2000 into Covisint. Covisint offers members significant reduction in transaction costs using its web-based EP, reductions in commodity component costs through electronic auctions and enhanced online product collaboration.

An early example of B2B marketplaces is the neutral, third party exchange: e-Steel. Ford, interested in gaining maximum cost savings and control over supply partners, launched a new purchasing program in 1995 that combined individual orders to negotiate larger discounts. It commissioned e-Steel in May 2000 to design and implement a supply network to provide a secure, real-time environment for its steel procurement, estimated at over \$1bn pa. Fuelled by consultant reports of estimated \$1200 savings *per car*, Ford's interest in the Internet as a major source of revenue was actively supported by its CEO.

By April 2000, despite additional membership (DaimlerChrysler, Renault and Nissan), others such as BMW and VW were reluctant to join, considering Covisint too inflexible. BMW has experimented with e-business since 1999, and after completion of a pilot with suppliers, launched its own private electronic procurement platform in March 2000. Frenetic B2B activity in April 2000 resulted in the launch of another private exchange: VW's electronic supply link (ESL), and two supplier consortium exchanges: one a commodity hub for car tyres by seven firms (Rubbernetwork), and the other, plastic injection moulding materials and equipment (Omnexus). In Europe, suppliers are concerned over the speed of developments, the implications for price and with some already investigating their own EP systems, organised a web study group. This was followed by the launch of two supplier hubs: SupplyOn, led by Bosch, and TecCom, an aftermarket parts exchange. Towards the close of 2000, the B2B momentum originally initiated by Covisint slowed, first through US anti-trust suits, and second by the global technology stock market crash. The most recent and significant development is the decision by 1<sup>st</sup> tier supplier Delphi to launch a portal hosted by Covisint. However, after a CEO search lasting a year and spending of \$12m a month, profits are unlikely before 2003.

### 4. METHOD

The research builds on work by the 3DayCar programme, launched in 1999, to study the role of customer order fulfilment in the UK auto industry and is about to enter its second phase, 3DayCar II, which focuses on building-to-order in Europe. A key finding of the original study is that 85% of delay in the order pipeline is derived from data-processing systems: order entry, order processing and scheduling, *not vehicle manufacturing*. A key aim of the technology research stream in the forthcoming programme is to show how IS, including procurement, can be integrated into the customer fulfilment process, in order to compress customer order-to-delivery lead-time.

This paper comprises part of an over-arching research question: *how can IS-related planning enable industry-level, electronic collaboration across the automotive sector?* This study uses archival research and interviews to build an exploratory study of e-hub proliferation, since their emergence in 1998. The goal is to develop a classification of the impact of EP on industry structure as it exists today and that enables IS strategy. This is consistent with a case approach, where broad questions are followed by the identification of key constructs and variables that guide sensemaking and develop a strong case for analysis (Eisenhardt 1989, Yin 1994). An initial meeting with one manufacturer's e-commerce director established that a study on EP and hubs was viable. Following piloting of the questionnaire, three firms were approached with structured questions designed to focus on EP benefits and barriers. Interviews were conducted with senior procurement managers at Ford, Covisint, Bosch, SupplyOn and Volkswagen.

## 5. AUTOMOTIVE CASES

The interview summaries (Table 2) show the perceived benefits of e-procurement membership together with an analysis of barriers. The three automotive cases and their associated e-hubs: Ford (Covisint), Bosch (SupplyOn) and Volkswagen (Electronic Supply Link) are now considered in depth.

### 5.1 Ford (Covisint)

Ford is undergoing a major procurement initiative driven by price involving introducing a standard application to all purchasing departments. Covisint is perceived as an opportunity to develop the electronic marketplace as a means of utilising the ‘reverse auction’ on commodity and production materials. The expected benefits, where implemented, include price reduction, minimisation of paper transactions and electronic audits, leading to lower material costs, increased transaction efficiency and greater control over maverick spending. However, despite a joint business and IT team of 300 people, IS-related problems persist. In adopting EP, Ford feels it must ‘institutionalise’ the new system to comply with the needs of the central purchasing commission who approve all spending. This has encountered resistance by managers who already have well-established purchasing relationships. In addition, system operators who were used to having bespoke software, must use only standard EP systems. Thus, Ford has a way to go before reaching its goal of: *“Moving the buying community away from the transaction [and] to give them the tools which will help them in negotiation, strategic thinking and disseminating information from a lower level.”*

Despite success in price reductions, a key market-related barrier to Covisint remains the reluctance by suppliers to subscribe over fears of the effect of reverse auctions on component price. Ford is renowned for its cost focus, and this affects the willingness of its partners to accept not just EP, but also collaboration in online product development. There is increasing concern that: *“They may lose a captive market if they are not customer-focused enough.”*

<b>Benefit</b>	<b>Ford (Covisint)</b>	<b>Bosch (SupplyOn)</b>	<b>VW (ESL)</b>
Expected	- Price reduction - Minimise paper transactions - Electronic audits	- Reduced time to market - Less manual processes - Cost transparency	- Optimise business processes with suppliers and the whole supply chain, not just VW
Realised	- Lower material costs - Transaction efficiency - Control over maverick spending	- Integrated EP, collaborative engineering and logistics. - Core competence in building electronic supply chains - A leader in e-standards	- Reduction in order leadtime - Reduction in unproductive waste
<b>Barrier Intra-Org</b>			
Structural-cultural	- New systems must align with the needs of central purchasing	-	- Centrally based purchasing system
Managerial	- Resistance by departments who already have well established p. relationships	- A desire to <i>wait and see</i> what other suppliers do, in terms of e-business strategy	-
User	- Staged implementation means its difficult to identify the system as a definitive product - Operators used to bespoke system design: difficulties in adapting to standard package	- Expectations of ‘big benefits’ not realised over the short term	- Proliferation of individual systems & stds requires considerable knowledge by users: eg: UN stds for currency, EDI stds used for logistics, but not purchasing
Technical	- 15 year old, mainframe systems	- Lack of a universal system standard: suppliers were involved only after Bosch had achieved back-end integration	- Initial problems in the Internet technology caused by a high number of system users, each varying their response time.
<b>Barrier Inter-Org</b>			
Structural-political	- Reluctance by suppliers to subscribe: fears over r. auctions	- Some ‘competitive conflicts of interest’ with Covisint	-

**Table 2** E-procurement benefits and industry transformation barriers (ITB)

## 5.2 Bosch (SupplyOn)

Bosch is a major shareholder in the supplier consortium exchange, SupplyOn, founded in 2000 to host online procurement for 1<sup>st</sup> and 2<sup>nd</sup> tier component suppliers. The expected benefits focus on reduction in order-to-delivery leadtime, reduction in manual processes and cost transparency. Bosch has realised a number of benefits: fully integrated EP, simultaneous engineering and logistics, enhanced core competency in building electronic supply chains, and is leading negotiation of industry e-standards. Bosch is renowned for innovative engineering and was concerned it should develop its online engineering and purchasing capability. Its motivation for developing an e-hub differs significantly from Ford: *“I hope reduced price will be one of the secondary benefits, but it's not our focus.”*

Introducing an online materials purchasing and development system encountered reservations from managers and users. Some managers wanted to wait until other suppliers had implemented systems. However, Bosch was eager to gain first-mover advantage, particularly over system standards. Some users became reluctant after the reality of using an Internet system did not live up to expectations. The lack of a common standard during system trials meant suppliers were not involved until Bosch had achieved full back-end integration of its own mainframes. This follows the strategy of SupplyOn to become an integrated concept across all members, not just a supplier directory or online bidding website. Bosch's goal to develop SupplyOn as a collaborative supplier engineering portal, based on building relationships in the supply chain and not simply price, means that it takes an ambivalent view towards Covisint as a potential competitor: *“There is conflict, but also a complementary approach.”*

## 5.3 Volkswagen (Electronic Supply Link)

Volkswagen established its private electronic supplier link (ESL) in 1999 as a fully Internet-enabled EP system for 1<sup>st</sup> tier suppliers. Its aims were to improve procurement-based processes, where ESL is offered free to selected suppliers. Online product collaboration using CAD/CAM such as Catia and ProEngineer are also offered, but on a separate system to ESL. VW's approach to e-hubs, like Bosch, is different from the Ford/Covisint model: *“The policy of VW is not to earn money from the Internet.”*

VW's expected benefits were to optimise business processes across its supply chain, not just for itself. Its supplier link saves considerable time in the procurement process and eliminates most unproductive work. While it represents a relatively simple system, in comparison with Covisint, it faced a number of barriers during implementation and use. For instance, ESL retains its central purchasing system which as it is not internet-based, requires an additional interface connection with its mainframe computer to link it to suppliers, adding cost and time to the process. Also, users still find that the high number of system standards requires considerable knowledge of procurement, currency and logistics. As a private trade exchange based internally, ESL has experienced few problems of market barriers or supplier acceptance, particularly as the system is offered free. However, in the future VW may suffer from an increase in individual systems and standards that Covisint, with its 'one-stop communication' philosophy, has attempted to eradicate. VW's approach to e-procurement can be summarised as: *“To optimise business processes with our suppliers [with] the whole supply chain, not just VW.”*

## 6. ANALYSIS

The three cases highlight the different motivations during development and deployment of e-hubs. Ford's EP policy is to use the hub as a lever to gain further component and material price reductions globally, despite the reluctance of some suppliers to collaborate with Covisint. Bosch's motivation for SupplyOn stems from its desire to develop highly innovative products through collaborative online engineering, as well as improving purchasing capability with suppliers. VW's aim is to optimise business processes across its supply chain, not just for itself. These characteristics can be classified in terms of hub *membership*, and the buyer-supplier *relationship*. Figure 2 provides an exploratory framework that classifies 4 types of e-hub encountered in this research. Emergent types are classified using Tapscott et al's (2000) typology of business webs. *Agora* is the simplest, comprising wide-

ranging, inclusive membership and a relationship based on liquidity and dynamic pricing, e.g: e-Steel. *Alliance* represents inclusive membership and a collaborative relationship of sharing and knowledge, e.g: SupplyOn. *Value chain* is based on exclusive membership and a collaborative relationship fostering trust and reliability between a manufacturer and suppliers, e.g VW/ESL.

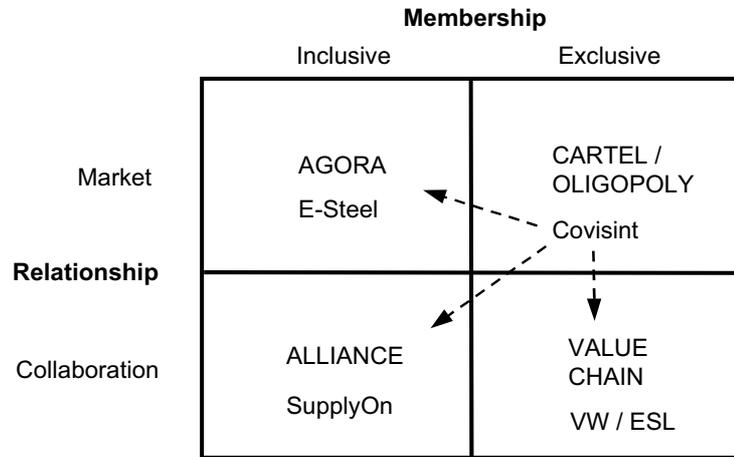


Figure 2 E-procurement interactive space

*Cartel/Oligopoly* is an exclusive membership where the primary concern is to optimise price. This describes Covisint: a club of powerful VMs seeking to create one buyer in the market. However, by focusing on material cost in the supply chain and restricting entry to new shareholders, Covisint has reduced supplier goodwill to collaborate, affecting supply chain transparency that is essential for reducing customer order delivery leadtime. The Cartel/Oligopoly represents an imperfect state that resists classification in Tapscott et al.’s business web classification. The arrows indicate alternative strategies for Covisint to shift emphasis from the current position as an ‘exclusive cartel’.

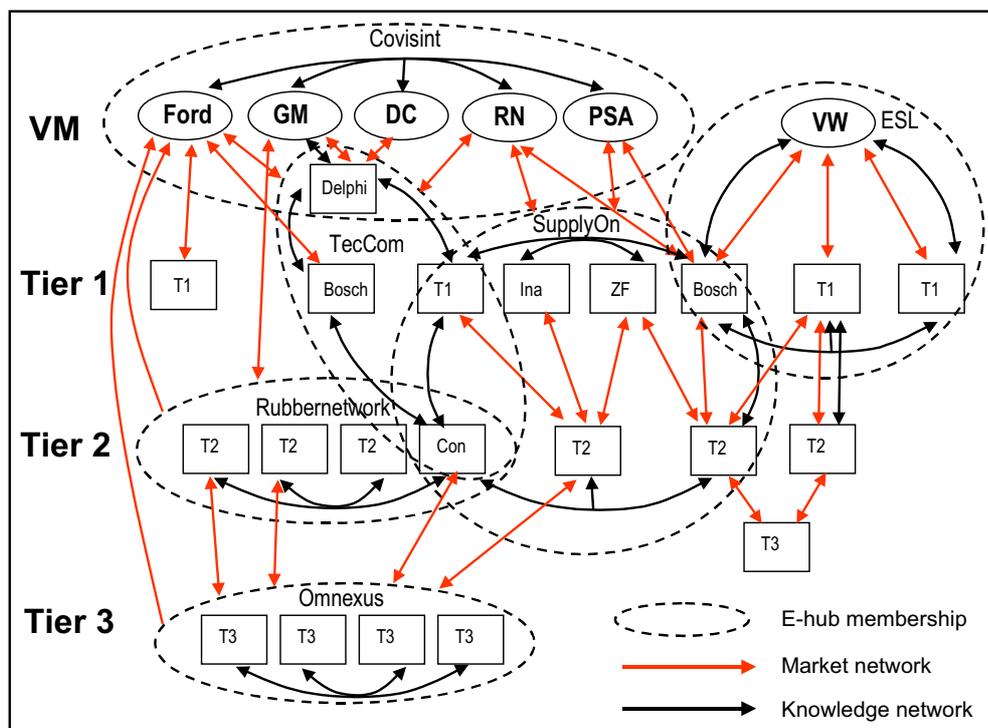


Figure 3 Current Auto industry e-hub structure

## 5.1 From bespoke to e-spoke

The classification of EP and e-hubs in terms of relationship and membership, enables a new interpretation of the impact on industry structure. Figure 3 shows auto industry hub affiliation and maps the flow of resources and collaboration across all tiers in the supply chain. Unlike the simplistic models in the literature (Figure 1), the introduction of e-commerce results in *a mess of overlapping networks*. Electronic commerce has evolved from a maze of bespoke EDI systems, to a structure that bears little resemblance to the single industry hub design originally envisaged by Covisint's founders.

Thus, are hubs the centre of things? In the race to re-engineer the auto industry from its old economy origins, current structures appear closer to a loose arrangement of spokes than a hub. Overlapping networks compete for limited membership across the industry, resulting in isolated pockets of collaboration and irregular information flow. This research demonstrates that, if introduced without sufficient IS-related planning in terms of consideration for both price and collaboration, e-commerce simply *speeds up the mess*.

## 6. IMPLICATIONS FOR MANAGEMENT AND RESEARCH

This paper re-examines the perceived wisdom of the transition from supply chain to electronic hub. It confirms that a consortium-based approach is adopted if price is the prime motivation for founding an e-hub, e.g., Covisint (Baldi and Borgman (2001)). If supply chain management, supplier development and product innovation is of greater importance, then a private-based e-hub is adopted, e.g: SupplyOn and ESL. However, when applied at industry level, this research shows the resulting combination of structures to be sub-optimal.

While technology exists to create electronic marketplaces, acting as a 'one stop' procurement and product development hub, this requires collaboration of a critical mass of industry players to succeed. The advantages of cooperation amongst competitors brings mutual benefit, not least in the agreement of IT standards, such as the Button programme in Australia, and the Auto Industry Action Group in N. America. The proliferation of e-hubs by rival VMs and component suppliers in Europe and N. America can be explained by the presence of long-term e-commerce development projects by VW and Bosch, countervailing power exercised by suppliers concerned over the lack of representation within Covisint, and the desire to develop core competence in electronic markets. Overcoming problems of an overcrowded e-commerce environment requires refocusing the strategic objectives of existing hubs like Covisint, by developing and applying tools such as the EP matrix (Fig 2) and e-hub map (Fig 3).

Three findings are paramount: (1) The introduction of e-commerce has resulted in a mess of overlapping networks in the auto industry. (2) This is a shallow structure, lacking in supplier integration particularly of tiers 2 and 3, and resembles an ad-hoc arrangement of spokes rather than a singular hub design. (3) Can this be a long term strategy? Manufacturers and suppliers cannot sustain a system characterised by duplicated services, multiple standards and restrictions on membership that result in less than optimal numbers of industry partners. Current auto industry structure, therefore, displays symptoms of a mid-transitory phase in the EP development lifecycle.

As concerns research, this work examines the value of e-markets and the relationships that govern e-procurement processes. The exploratory cases question the simplistic portrayal in the current literature of one dominant hub aligned in the centre of an industry. In re-examining the transition from bespoke EDI to generic EP, it discovers conflicting motives and complex processes. Table 3 highlights the difficulties of implementing e-market strategies that attempt to reconcile the mutually exclusive nature of buyer-supplier relationships: price vs. collaboration, and inclusive vs. exclusive hub membership.

The technique of mapping current e-hub structures (Figure 3) provides an industry overview, though it omits the complete picture of resource and collaboration flow between all stakeholders. While this dispels the myth of simplistic e-commerce models in the auto industry, work is required in developing a method that reflects the underlying complexity of flows of goods, services and knowledge. Tapscott

et al.'s typology of business webs (*Agora, Alliance etc.*) provides a useful grounding, although the classification here of *network*, represented by arrows, require further definition beyond simply *market* and *knowledge*. Further research will include more cases with a broader selection of stakeholders: customers, dealers, VMs, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> tier suppliers and logistics firms.

## 7. CONCLUSION

Many organisations are being taken in by simplistic, technology-driven models professing to enhance competitive and cooperative capability. In re-examining the perceived wisdom of transition from supply chain to electronic hub, this research finds multiple overlapping networks competing for membership, isolated pockets of collaboration and irregular flows of revenue. Thus, current auto industry structure is shallow, lacking in supplier integration, and resembles an ad-hoc arrangement of spokes rather than a singular hub design. This transitory phase must be resolved, together with the conflict in motivation between price, collaboration and membership exclusivity, before the auto industry can realise full benefit from electronic markets and be restored to a state of profitability.

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