

[020-1119]

**Managing ERP Systems and Enterprise Strategy: A  
Dynamic Enterprise Reference Grid**

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**POMS 23<sup>rd</sup> Annual Conference**

Chicago, Illinois, U.S.A.

April 20 to April 23, 2012

**Stream:** ERP, Collaborative Enterprise Governance and Virtual Value Chain

## **Abstract**

This paper investigates how enterprise resource planning (ERP) systems can influence enterprise management strategy and structure and vice versa. The research provides an up-to-date literature review, empirical case studies and proposes a new conceptual model – the Dynamic Enterprise Reference Grid for ERP (DERG-ERP) – as a management contingency framework.

## **Keywords:**

Enterprise Resource Planning (ERP), Enterprise Strategy, Dynamic Transformation

## **1. Introduction**

Enterprise Systems (ESs) – particularly Enterprise Resource Planning – ERP systems) have experienced dramatic change over the last few decades. Recent studies on ERP field often concern the core functional modules improvement for internal integrated systems (He, 2004; Michel, 2000) at single firms' level to increase their competitive advantage (Chen, 2001). Less emphasis has been placed on how ERP systems can become more supportive of dynamic change in *enterprises*.

In this paper, the *enterprise* is defined as, "... an entity including partnerships or

associations that can be made up of parts of different companies” (European Commission, 2003). Specific research has recognized that inter-firm relationships should be based on new operational concepts and technical solutions such as Service Oriented Architectures (SOA) and Software as a Service (SaaS) (Bass and Mabry, 2004; Torbacki, 2008; Candido *et al.*, 2009). Despite an emerging body of literature about inter-firm paradigms (Binder and Clegg, 2006; Zhang and Dhaliwal, 2008) and inter-organizational information systems (IS) (Rodon *et al.*, 2011), enterprise management and the relationship to ERP system types remains theoretically under-developed.

A comprehensive approach of conceptualizing the interplay between ERP systems and strategic enterprise management is needed. Therefore, the objectives of this paper are (1) Investigate ERP systems developing trends (2) Investigate different enterprise strategies (3) Develop a theoretical framework – the DERG-ERP – explaining the correlations between different ERP system types and enterprise structures illustrated with case studies.

## **2. Conceptual Foundation**

### **2.1 From ERP to ERPII and the Future: ERPIII**

Traditional ERP is described as a single internally integrated IS used to seek competitive advantage (Blackstone and Cox, 2005, p.38; He, 2004) that supports intra-organizational operations. It always typically has a high degree of proprietary

development and considerable financial commitment. Although coordination of inter-functional divisions is facilitated by ERP systems, ERP has its roots in the manufacturing industry and does not always readily support the future e-business requirements (Bond *et al.*, 2000; Moller, 2005). In response new functional modules have been developed to form ERP II which is recognized as an integral part of business strategy to enable inter-organizational collaboration by extending value chains to close and trusted partners (Bagchi *et al.*, 2003).

Although ERP II is currently the dominant IS infrastructure to support modern manufacturing enterprises, many companies still endeavour to re-design their operations to become more dynamic in order to anticipate change as global business environment is continuously changing with increasingly competition,. Implementing ERP in a dynamic environment presents many challenges due to 'temporary existence' and will tend to use predominantly web-compatible integration technology such as SOA, SaaS, Utility and cloud computing (Candido *et al.*, 2009; Xu *et al.*, 2002) which are now considered necessary to make more dynamic enterprise structures a reality. In this paper we refer to the future generation ERP systems as *ERP III*. The authors define ERP III as *a flexible, powerful information system incorporating web-based technology, which enables dynamic (virtual) enterprises to offer increasing degrees of collaborative dynamic responsiveness through increased functional scope and scalability.*

The above discussion has critically investigated the recent trends from ERP, ERPII towards ERPIII (*cf.* objective 1) on which the new contingency framework (*cf.* objective 3) given at the end of this paper is partly founded.

## **2.2 Enterprise Strategy**

Vertically integrated enterprises (VIE) operate as single multi-functional firms striving for large scale of economy which have conventional hierarchies (Lynch, 2003) and are recognised as “a response to pre-existing market power problems or as a strategic move to create or enhance market power in upstream and downstream markets” (Joskow, 2003, p.25). There is a downside to VIEs because VIE’s boundaries are mediated by firm structure and engage-abilities (Argyres, 1996), which requires strategists to be able to adjust their strategy quickly and easily to address shifts in different types of market demand, and develop new core competences. To mitigate the downside of VIEs, *extended enterprise* structures and strategies should be used.

‘Extended enterprises’ (EE) are defined by Davis and Spekman (2004) as “... the entire set of collaborating companies...which bring value to the marketplace...” and by Lyman *et al.*, (2009) as “... a business value network where multiple firms own and manage parts of an integrated enterprise”. Thus extended enterprises are deemed to be far more agile than vertically integrated enterprises. But even EEs cannot manage to follow highly turbulent and unpredictable market behavior in which the *virtual enterprise* (VE) structures and strategies must be used (Byrne and Brandt, 1993).

Generally, VEs are described as fluid, flexible combination of components of one or more business entities assigned by decomposed specific objectives to deliver value to a market (Davenport, 1998) or can be thought of as innovative IT networked structures in which temporary alignments are delivered. Thus, this kind of inter-firm relationship can more easily facilitate innovative agile operations (Cho et al., 1996) and deal with dynamic market needs (Madu and Kuei, 2004) by heavily utilising new web-based information and communication technologies (ICT) tools.

The above discussion has summed up and compared VIEs, EEs and VEs (*cf.* objective 2) on which the new contingency framework (*cf.* objective 3) given at the end of this paper is partly founded.

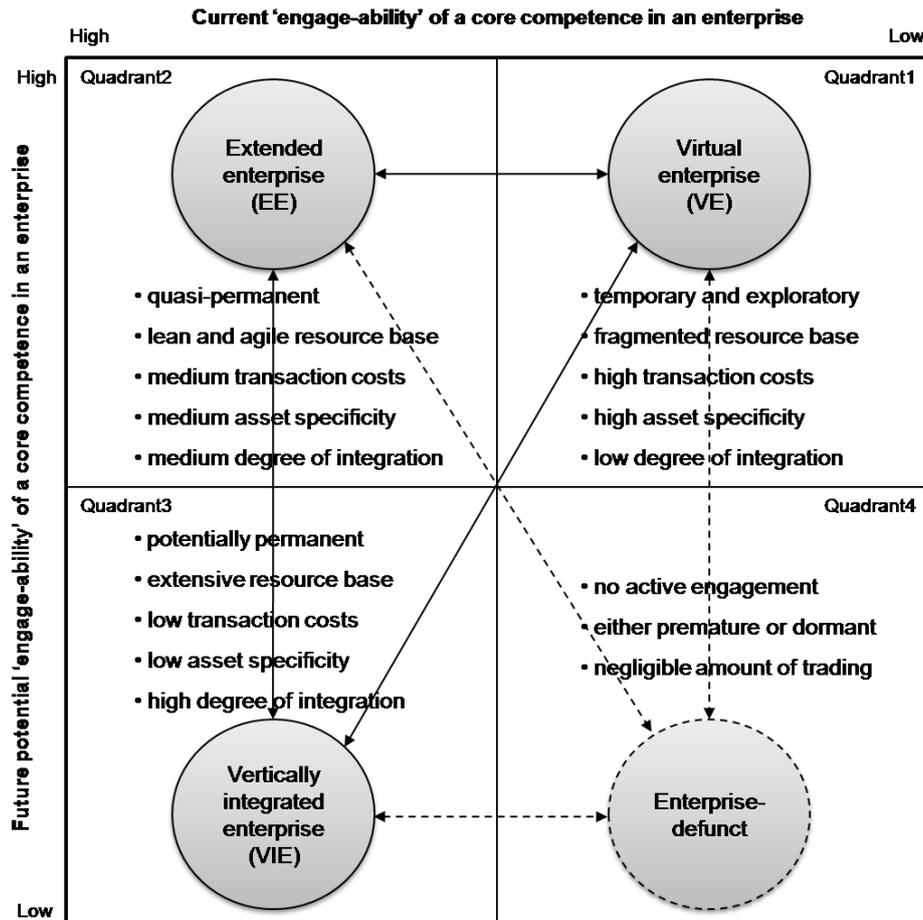
### **2.3 Causal Links between ERP and Collaborative Enterprise Governance**

The above literature covers ERP, ERPII, and potential ERPIII capabilities, as well as VIEs, EEs, and VEs characteristics. This research now proposes some provisional causal links between these two disciplines.

Specifically, we propose that traditional ERP and ERPII are best for VIE and EE respectively (*cf.* strong links). Emerging literature on post-ERPII systems (i.e. ERPIII) are fewer but suggest ERPIII is most appropriate for VEs (*cf.* potential strong links). In further, subsidiary correlations are also identified between ERP and EE, ERPII and

VIE, as well as between ERPII and VE (*cf.* weak links).

The authors use Binder and Clegg's (2006) "Collaborative Enterprise Governance" (CEG) concept to help explain these strong, weak and potential strong correlations further. In particular, we take the Dynamic Enterprise Reference Grid (DERG) shown in Figure 1 as one point of departure from established theory. This is because the DERG indicates and summarizes the prevailing type of core competence associated with four different dominant current and future types of enterprise structure and their engage-ability. Any one paradigm may change into another as a result of a changed predominance in the type of core competence upon which it built; solid arrows show planned changes and broken arrows show unplanned changes.



**Figure 1.** Dynamic Enterprise Reference Grid (DERG) used in Collaborative Enterprise Governance (Binder and Clegg, 2006).

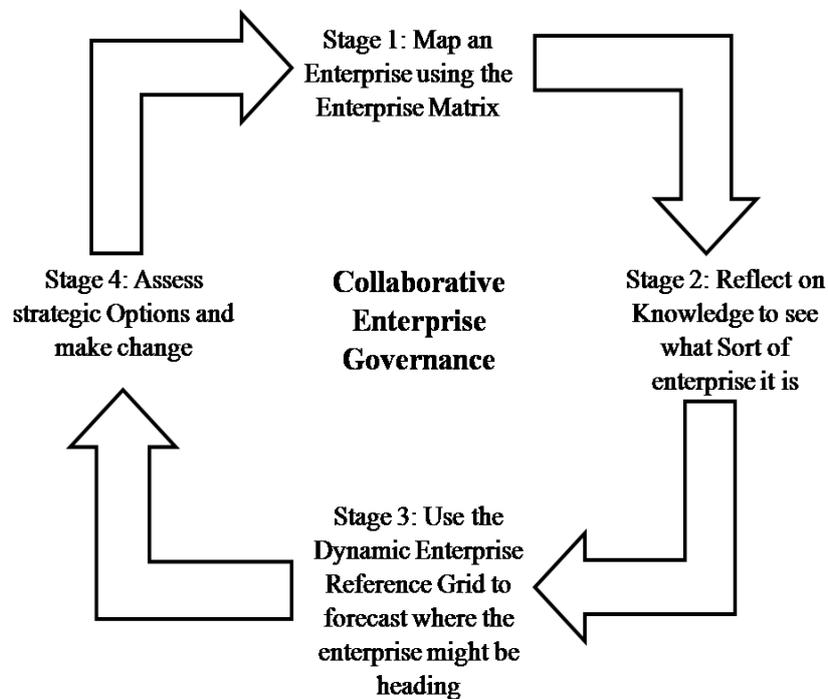
However, the current DERG is limited as it only focuses on enterprise structures and strategy and does not consider IS strategy. To extend the DERG and incorporate IS strategy into it we use Galliers's (1994) 'IS Strategy Formulation' (ISF) which elaborates the changing perceptions of IS strategy. ISF is taken as another point of departure from established concepts in the field (in addition to Binder and Clegg's DERG).

The unification of these two theoretical foundations and the above literature is used to

create a new contingency framework (i.e. DERG-ERP) given at the end of this paper (cf. objective 3).

### 3. Research Methodology

The Collaborative Enterprise Governance (CEG) methodology, shown in Figure 2, was used in this research. The tools used in CEG fall into four stages. Stage 1 uses the 'Enterprise Matrix' to map enterprise modules, Stage 2 uses the theories discussed previously to correlate enterprise structure to ERP type, Stage 3 uses the Dynamic Enterprise Reference Grid (DERG) framework (cf. Figure 1) to forecast where the enterprise might be heading, and Stage 4 assesses the options to make available changes. CEG is cyclical, and therefore, the final stage re-initiates Step 1.



**Figure 2.** The Collaborative Enterprise Governance (CEG) Methodology (Binder and Clegg, 2007).

CEG was applied to two Chinese manufacturing companies; Lanye and Zoomlion, which were the empirical input into inducting the new contingency framework (*cf.* objective 3). For brevity only the Lanye case study details are given in the Case Study section below.

## **4. Case Study: Lanye**

### **4.1 Shifting from a Manufacturing Supplier via Mergers & Acquisitions (T1) into a fully Vertically Integrated Enterprise (T2)**

The precursor of Lanye – The Heavy Industry Company – was a quarrying factory and concrete manufacturer, which could be viewed as a ‘defunct enterprise’ due to its simplex operations with limited amount of commercial active engagement (at Time 1 – T1 – *circa* 1975). However, information technologies were initially applied with limited computer efficiency due to the transaction-specific assets of Lanye. With the impetus derived from self-development and economic scale growth, the senior management decided to bring in a set of advanced technical information tools such as computer-aided design (CAD) and office automation (OA) to improve its traditional physical business processes. Meanwhile, Lanye adopted mergers and acquisitions (M&As) strategies for pursuing supply chain integration which covers its production, marketing and logistics, which has resulted in added-value creation, external industrial expansion, and increased product portfolios differentiation.

As per CEG Stage 1, the Enterprise Matrix was used to map Lanye’s operations and determine its enterprise structure *circa* 2004 (at T2); this is given in Table 1 and demonstrates Lanye’s value stream, its value members and what each does at each stage.

**Table 1.** Enterprise matrix for Lanye - transforming from defunct enterprise (T1) into VIE (T2)

Collaborative activities: Concrete and mixer design & deliver T1→T2		Value stream					
		Process start	→			Process end	
Value Member Classification		Concrete and mixer design	Ultra-raw materials supply	Concrete and mixer realization	Concrete and mixer delivery	In-service	
<p style="text-align: center;">↑</p> <p style="text-align: center;">Value members</p> <p style="text-align: center;">↓</p>	High Involvement	Prime contractor (Lanye)	<ul style="list-style-type: none"> <li>• Invite the vendors</li> <li>• Evaluate the vendors’ capabilities</li> <li>• Sign the contracts</li> </ul>	<ul style="list-style-type: none"> <li>• Find suppliers</li> <li>• Assess the quality of raw materials</li> <li>• Sign the contracts</li> </ul>	<ul style="list-style-type: none"> <li>• Manage and control the production line and raw material sources (i.e. supply chain upstream)</li> </ul>	<ul style="list-style-type: none"> <li>• Deliver the final products to the clients and consumers</li> <li>• Schedule and control the transportation</li> </ul>	<ul style="list-style-type: none"> <li>• Customer services management</li> <li>• Offer relevant after-sales services</li> </ul>
		Operations and Marketing (Acquisitions Jinding Mining & Quarry Company, Jinjiang Cement Company, etc.)	<ul style="list-style-type: none"> <li>• Deal with customer requests</li> <li>• M&amp;As strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Backward integration</li> <li>• Explore new sources</li> </ul>	<ul style="list-style-type: none"> <li>• Place orders to the suppliers</li> <li>• Sales planning</li> <li>• Inventory management</li> </ul>	<ul style="list-style-type: none"> <li>• Inbound and Outbound logistics</li> <li>• Customer orders withdraw</li> </ul>	
		Purchasing, design and manufacturing (in-house)	<ul style="list-style-type: none"> <li>• Concept design</li> <li>• ‘Matching Ratio’ design</li> <li>• Product R&amp;D</li> </ul>	<ul style="list-style-type: none"> <li>• Purchase ultra-raw materials (e.g. pebble, yellow sand, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• Raw materials procurement (plan)</li> <li>• Manufacture the final products</li> </ul>		
		Sales and distribution (in-house)			<ul style="list-style-type: none"> <li>• Materials distribution</li> <li>• Supplier relationship management (particularly for the upstream)</li> </ul>	<ul style="list-style-type: none"> <li>• Logistics and transportation</li> </ul>	
		Financial Control (in-house)				<ul style="list-style-type: none"> <li>• Payments and invoices</li> <li>• Work with other functional divisions</li> </ul>	
		Low involvement	Business promotion and sales after-service provider (in-house)				<ul style="list-style-type: none"> <li>• Manage relations with customers</li> <li>• Call center</li> <li>• After-services (feedback, revisit, etc.)</li> </ul>

Being a prime contractor placed Lanye in an influential position; able to issue primary contracts, monitor the ultra-raw materials, control production and supply chain upstream, manage the products delivery, etc. The operations and marketing departments worked with merged and acquired firms (e.g. Jiuding Mining & Quarry Company, Jinjiang Cement Company) through M&A – backwards integration to deal with customer orders, place orders to suppliers, manage the inventory and inbound & outbound logistics. New concrete and mixer with a set of certain ‘matching ratio’ were designed by the R&D division. Ultra-raw materials were planned to be purchased by the sales and distribution departments, which would be delivered to warehousing and manufacturing according to the transportation scheduling. The financial department, cooperating with other functional branches, focused on payments and invoices of all the transactional activities. Customer relationships were also managed via ‘call centre’ and other ‘after-sale’ services.

After merged some competitors operating in the same industry level through the stock acquisitions strategy, Lanye’s organizational structure had shifted into a larger size of manufacturing firm with more complexity and increased business growth. This rapid change combined with incumbent isolated systems and culture differentiation stemming from the M&As strategy required Lanye to start-up its ERP project to facilitate the real integration internal operation processes and embrace the enterprise concept. During implementation, the ERP system enabled Lanye to achieve the high degree of intra-integration across different functional units and promote the

organizational structure re-engineering, and have the potential to collaborate better with the external partners. Therefore a vertically integrated enterprise (VIE) is depicted in T2 with aspirations to become a more virtual one.

#### **4.2 Shifting from a Vertically Integrated Enterprise (T2) into a Virtual Enterprise (T3)**

During the post-vertical integrated operations, the top managers could not clearly determine value member's roles, and they had not established available relationships to integrate separate entities. Also, the communication to all constituencies including employees, suppliers, customers, and shareholders was not adequate. These endogenous factors forced Lanye to re-conform and streamline its resources and assets. Simultaneously, the supply network integration, advanced IT/IS improvement, and transporting costs jack-up occurred unexpectedly (i.e. exogenous factors). Thus, for its next strategic developments establishing new enterprise-level IS strategy was imperative. Aiming for this, senior management re-assigned the value member classification into their virtual enterprise (as shown by the new enterprise matrix in Table 2, representing T3, *circa* 2008), this was dependent upon their engage-abilities and contribution to fulfil Lanye's new enterprise-wide mission – achieving the agile manufacturing with quick responses to the global marketing demands. The marked change from previous strategy was that the value members (former and new ones) were classified *within* Lanye's new enterprise boundaries and provided essential core capabilities connected through virtual IT networked systems. These alterative features

characterize a *virtual enterprise*.

Specifically, Lanye (*cf.* Table 2) worked with Jinjiang and Zhuo Qi who offered ultra-raw materials and facilities for manufacturing the concrete. Fine ore, coal ash and other ancillary agentia were offered by Mei Bao, Su Yan Electric Power Station, Construction and Science Institution, etc. for the concrete and mixer realization through medium-short term collaboration. Cooperative tasks and short-term projects were completed by Lanye and strategic partners (e.g. JNXYT Ltd., Chinese Construction Ltd.), suppliers (e.g. Zoomlion) within the virtual context. Network communication was achieved via new ERP systems provided by Alutex (also the consulting company) along with GPS system and Virtual Private Network (VPN) offered by Lanye's own IT department. The financial division was now also concerned with external business links rather than purely focusing on back-office transactions.

**Table 2.** Enterprise matrix for Lanye - transforming from VIE (T2) into VE (T3)

Collaborative activities: Concrete and mixer design & deliver T2→T3		Value stream						
		Process start					Process end	
Value Member Classification		Concrete and mixer design	Ultra-raw materials supply	Concrete and mixer realization	Concrete and mixer delivery	In-service	Collaborative project (where product/service to be used)	
High Involvement	Prime contractor (Lanye)	<ul style="list-style-type: none"> <li>Invite the vendors</li> <li>Evaluate the vendors' capabilities</li> <li>Sign the contracts</li> </ul>	<ul style="list-style-type: none"> <li>Find suppliers</li> <li>Assess the quality of raw materials</li> <li>Sign the contracts</li> </ul>	<ul style="list-style-type: none"> <li>Manage and control the production line and raw material sources (i.e. supply chain upstream)</li> </ul>	<ul style="list-style-type: none"> <li>Deliver the final products to the clients and consumers</li> <li>Schedule and control the transportation</li> </ul>	<ul style="list-style-type: none"> <li>Customer services management</li> <li>Offer relevant after-sales services</li> </ul>	<ul style="list-style-type: none"> <li>Offer finished concrete</li> <li>Technology supervision</li> </ul>	
	Strategic collaborative Partners (medium-short term collaboration)	Jinjiang and Zhuo Qi (internal)		<ul style="list-style-type: none"> <li>Provide stive and 42.7# concrete</li> <li>Offer new patterns of building materials</li> </ul>	<ul style="list-style-type: none"> <li>Provide raw materials</li> <li>Provide major equipments and facilities</li> </ul>			
		Mei Bao		<ul style="list-style-type: none"> <li>Supply ultra-materials</li> </ul>	<ul style="list-style-type: none"> <li>Provide fine ore</li> </ul>	<ul style="list-style-type: none"> <li>Deliver for warehousing and manufacturing</li> </ul>		
		Construction and Science Institution		<ul style="list-style-type: none"> <li>Supply ultra-raw materials</li> </ul>	<ul style="list-style-type: none"> <li>Provide ancillary agentia</li> </ul>	<ul style="list-style-type: none"> <li>Delivered by the 3<sup>rd</sup> party trading partners</li> </ul>		
		Su Yan Electric Power Station		<ul style="list-style-type: none"> <li>Supply ultra-raw materials</li> </ul>	<ul style="list-style-type: none"> <li>Provide coal ash</li> </ul>	<ul style="list-style-type: none"> <li>Deliver for warehousing and manufacturing</li> </ul>		
		JNXYT Ltd.			<ul style="list-style-type: none"> <li>Provide advanced 52.5# concrete</li> <li>Provide building stones</li> </ul>			
	Strategic project partners (short-term collaboration)	Chinese Construction Ltd.	<ul style="list-style-type: none"> <li>Technology research and development</li> </ul>		<ul style="list-style-type: none"> <li>Product quality management</li> <li>Production control</li> <li>Human resource mgt.</li> </ul>			<ul style="list-style-type: none"> <li>Bid the project</li> <li>Project execution</li> <li>Materials testing</li> <li>Sign the contracts</li> </ul>
		Nanjing Govern-ent			<ul style="list-style-type: none"> <li>Operations control</li> </ul>			<ul style="list-style-type: none"> <li>Issue and scheme the project</li> </ul>
		Design-make-deliver (e.g. Southeast University, Lanye's own transportation)	<ul style="list-style-type: none"> <li>Concept design</li> <li>Craft R&amp;D</li> <li>R&amp;D centre</li> </ul>		<ul style="list-style-type: none"> <li>Manufacture concrete and mixer</li> <li>Combine the advanced technology and manufacturing expertise</li> </ul>	<ul style="list-style-type: none"> <li>Deliver components for making the final products</li> <li>Logistics and transportation</li> </ul>		<ul style="list-style-type: none"> <li>Empirical research</li> <li>Green technology and manufacturing</li> </ul>
		Suppliers and vendees (e.g. Jingjiang, Zhuo Qi, Zoomlion)		<ul style="list-style-type: none"> <li>Explore and yield ultra-raw materials</li> <li>Supply chain upstream</li> </ul>	<ul style="list-style-type: none"> <li>Provide raw materials in real time</li> <li>Provide crane</li> <li>Collaborate with Lanye via ERP &amp; GPS systems</li> </ul>	<ul style="list-style-type: none"> <li>Ship to the manufacturing plants</li> <li>Develop marketing strategies</li> <li>Provide crane</li> </ul>		
IT/IS partners	Alutec			<ul style="list-style-type: none"> <li>Consulting company for ERP adoption, application, and management</li> <li>IS mgt. (e.g. inventory and materials mgt.)</li> </ul>	<ul style="list-style-type: none"> <li>Consulting company for ERP adoption, application, and management</li> <li>IS mgt. in logistics and transportation</li> </ul>	<ul style="list-style-type: none"> <li>Payments and invoices</li> </ul>		
	Lanye IT department		<ul style="list-style-type: none"> <li>ERP&amp;GPS connection within the virtual context</li> </ul>	<ul style="list-style-type: none"> <li>Provide GPS systems</li> <li>Provide Virtual Private Network (VPN)</li> </ul>	<ul style="list-style-type: none"> <li>Provide GPS systems</li> <li>Control the logistics</li> </ul>	<ul style="list-style-type: none"> <li>Provide GPS systems</li> </ul>		
	Financial Control (Mostly Lanye does for whole value chain)		<ul style="list-style-type: none"> <li>Payments and invoices</li> </ul>	<ul style="list-style-type: none"> <li>Payments and invoices</li> </ul>	<ul style="list-style-type: none"> <li>Payments and invoices</li> <li>Work with other legal entities</li> </ul>			
Low involvement	Business promotion and sales after-service provider (Mostly Lanye does for whole value chain)				<ul style="list-style-type: none"> <li>Customer/clients services</li> </ul>	<ul style="list-style-type: none"> <li>Manage relations with customers</li> <li>Call center</li> <li>After-services (feedback, revisit, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>After-sales services</li> <li>Post-implementation audit</li> </ul>	

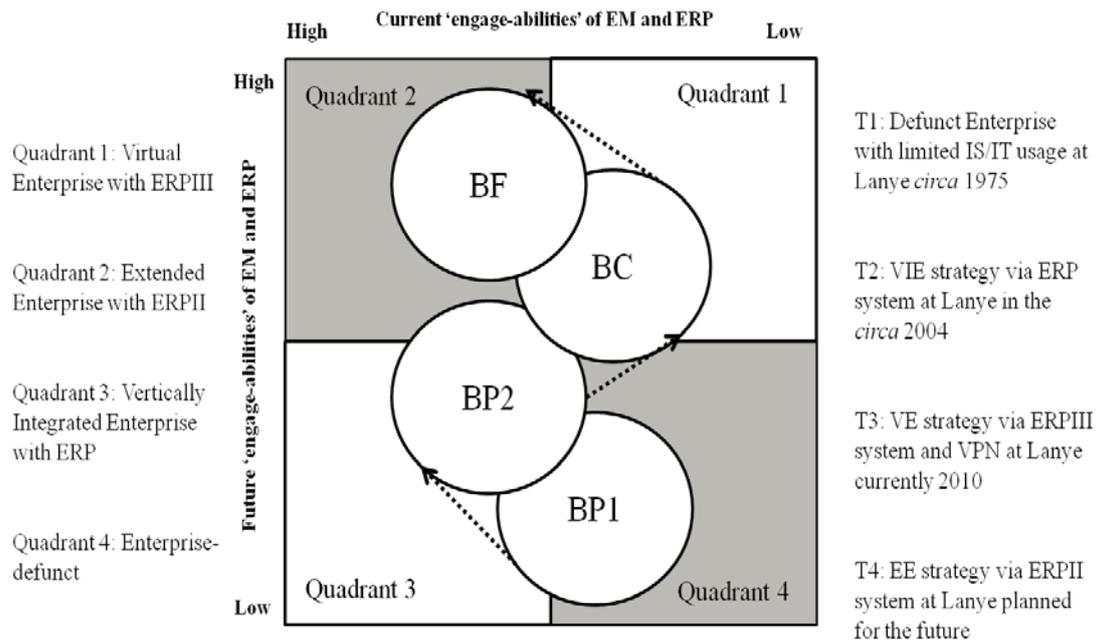
### 4.3 Shifting from a Virtual Enterprise (T3) towards an Extended Enterprise

(T4)

Integrated ERP systems with VPN has increased the efficiency and flexibility of Lanye's production, logistics, sales, and monitor with lower cost, and improved the business performance across the new enterprise boundaries. Moreover, the company has considered its strategic partners were critical to its enterprise strategy. Thus, Lanye could now be thought of as a virtual enterprise with high degrees of inter-integration and agile resources. Consequently, we suggest Lanye to apply extended enterprise structure to achieve a more stable organizational structure and long-term relationship with industrial collaborators within the global supply chain network. In this case, ERP systems must be used based on joint venture partnerships instead of web-based technologies. Meanwhile, potential risks were emerging around the dynamic and unpredictable environment and therefore, drive Lanye towards an extended enterprise (at T4). These transformations would enable Lanye to achieve a more stable enterprise structure and medium-long term relationship with industrial collaborators within its global supply network. In this scenario, at T4, Lanye would be advised to use ERPII type information systems instead of purely web-based technologies.

#### **4.4 Summarizing Lanye's Transitions using the DERG**

Figure 3 summarizes the transformational route experienced by Lanye as it shifted from T1 to T2 and subsequently into T3, which may finally towards the T4.

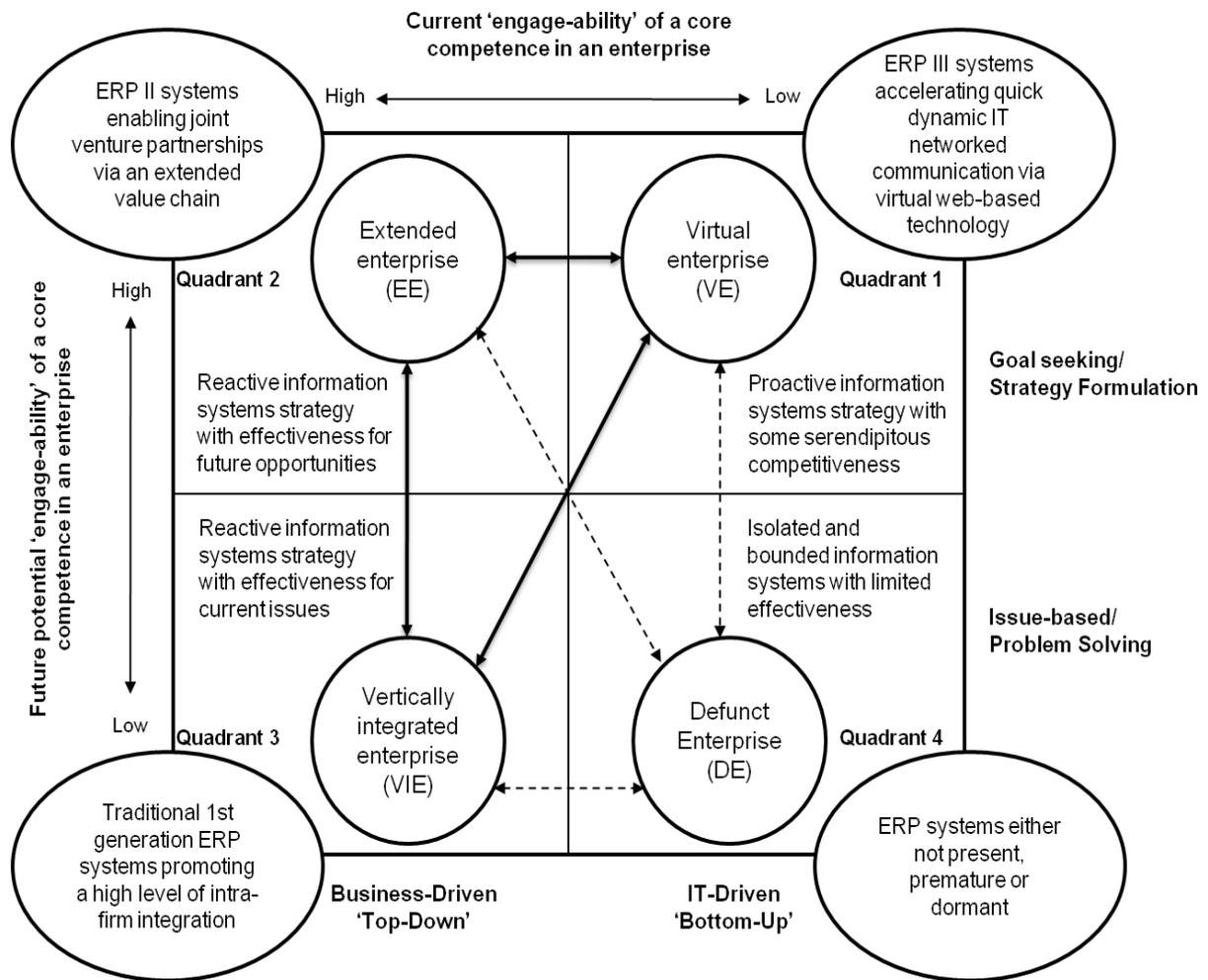


**Figure 3.** The Dynamic Enterprise Reference Grid (DERG) showing the Transformational route of Lanye

In addition to the Lanye case study, another case - Zoomlion has also been completed; which demonstrated another similar transformational routes from VIE to VE and towards EE. Both these cases can be used to illustrate the new (DERG-ERP) contingency framework (*cf.* objective 3) given in the section below.

## 5. Dynamic Enterprise Reference Grid for ERP (DERG-ERP)

Figure 4 is a new conceptual model showing a new contingency framework known as the Dynamic Enterprise Resource Grid for ERP (DERG-ERP) which demonstrates how CEG and ISF can be combined a used to guide enterprise resource planning and enterprise management decision making; it is also partly founded on the wider literature review given above.



**Figure 4.** Dynamic Enterprise Reference Grid for Enterprise Resource Planning (DERG-ERP)

### 5.1 Traditional ERP Systems use in Vertically Integrated Enterprise

In Quadrant 3 of the DERG-ERP (Figure 4) the VIE is used. The VIE serves large single manufacturing operations well, as they require ERP systems to support all core processes and provide a high level of intra-firm integration. They are best used when core competencies of strategic partners in an enterprise are currently highly engaged but may decline in attractiveness in the future; hence allowing for transaction costs

and scale of economies to be achieved.

## **5.2 ERP II Systems use in Extended Enterprises**

In Quadrant 2 of the DERG-ERP (Figure 4) the EE is shown. The EE best serves medium-to-large sized operations that have aspirations to form close partnerships within an extended value chain. ERP II systems with new advanced capabilities can cover supply chain management and customer relationship management that may involve active participation from other legal entities. ERP II is best used when core competencies of strategic partners in an enterprise are currently and in the near future highly engaging and therefore highly likely to be needed in new collaborations, with new modus operandi.

## **5.3 ERP III Systems use in Virtual Enterprises**

In Quadrant 1 of the DERG-ERP (Figure 4) the VE is shown. The VE presently best serves small-to-medium sized organisations which have aspirations for rapid growth and see themselves as innovative and likely to be serial and parallel collaborators. ERP III systems are able to facilitate such temporary and highly agile operations using non-proprietary web-based technology for computer integrated manufacturing systems with decentralised control on a global scale and scope. ERP III are considered to be pro-active information systems with some almost serendipitous (e.g. cloud-sourcing of innovative ideas) qualities if robustness, security and trust-levels can be adequately addressed.

#### **5.4 Defunct Enterprises and Information Systems Misuse**

In Quadrant 4 of the DERG-ERP (Figure 4) the defunct enterprise (DE) is shown. DE's occur when strategy, structurization or IS policy have gone wrong or are premature; the challenge for managers is to move to any other type of enterprise quickly. In DEs enterprise resource planning is typically not widely used, used inappropriately or without any great effectiveness. Tasks are normally driven by bottom up information technology purposes lacking strategic congruency.

### **6. Conclusion**

The objectives of this paper were to (1) investigate ERP systems developing trends (2) investigate different enterprise strategies (3) develop a contingency framework to explain correlations between ERP system types and enterprise structures illustrated with a longitudinal case study. Thus objective '1' and '2' were been met by the literature review; and objective '3' was met by the new DERG-ERP which is illustrated using the longitudinal Lanye case study showing how ERP systems were used to develop Lanye from a defunct enterprise, to a vertically integrated enterprise, to a virtual enterprise and finally describe its aspirational intent of becoming an extended enterprise.

The authors claim that there is a correlation between each of the pairings (i.e. ERP with VIE, ERP with EE, ERPIII with VE). The DERG-ERP contingency framework is

limited by being based on only two Chinese manufacturing companies; and so is currently being tested on other service and manufacturing companies in the UK and China. This work contributes to a gap in extant literature about the correlation between ERP systems and manufacturing enterprise strategies; and gives some practical decision support to guide IS and enterprise managers.

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