Managing ERP, Interoperability Strategy and Dynamic Change in Enterprises

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Abstract

This paper explores the presumptions and importance of uniting ERP engage-abilities and inter-operational activities within the context of dynamic collaborative enterprises, as well as investigating how ERP systems cater for three enterprise forms and the resultant interoperability strategies. Building on the theoretical foundations of “Dynamic Enterprise Reference Grid”, this study has employed an exploratory inductive research approach using multi-case studies and interpretive grounded theory method. The central contribution is a conceptual framework which demonstrates the adoption of ERP within three enterprise paradigms and how one can morph into another for achieving agile interoperability strategy. Findings suggest that the design and governance of newly enterprise structures and interoperability strategy can be affected by preferable information systems besides of the core competence. Furthermore, with the implications from this paper, practitioners will be better able to steer their enterprise strategies and improve the operational performance through the inter-firm collaboration and ERP systems implementation.

Keywords:
Enterprise Resource Planning, Interoperability Strategy, Enterprise Structure, Virtual Value Chain
1. Introduction

As recent trends in business and technology have focused on inter-organizational collaboration and information system that enhance them (Banker et al., 2010), many companies recognize the critical interdependencies that exist among the firms, suppliers and customers, which cannot be described in terms of simple contractual exchanges, but involve the interactions and network effects with appropriate new enterprise paradigms, information technology (particularly Enterprise Resource Planning – ERP – systems), and interoperability strategies. This paper presents preliminary findings and analysis from research into ERP systems and enterprise paradigms accompanied by inter-operational activities. It also combines critical and prescriptive perspectives as a necessary means of making its contribution to the practitioner’s toolkit.

Management literature often refers to “organization” and “company” (Galbraith, 2002), this study uses the term “enterprise” to reflect the current phenomena whereby business activity is not always carried out by a single legal entity or by itself, which is explained further in this review. An enterprise is particularly defined as “…any entity irrespective of its legal form, which includes partnerships or associations that can be made up of parts of different companies, as well as regularly engaging in an economic activity.” (European Commission, 2003). The importance of such inter-firm relations has been recognized by the structural concepts of vertically integrated enterprises (Lynch, 2003; Joskow, 2003), extended enterprises (Powell, 1990; Davis and
Spekman, 2004) and virtual enterprises (Byrne and Brandt, 1993; Goranson, 1999) and in the related technical support systems such as web-based Service Oriented Architecture (SOA), Platform as a Service (PaaS), and Software as a Service (SaaS) (Bass and Mabry, 2004; Torbacki, 2008; Candido et al., 2009).

Although some arguments concern the core competences that affect the design and management of the enterprises structures (Binder and Clegg, 2006), the “interconnectedness” of inter-firm (i.e. intra-enterprise) governance is criticized as there lacks sufficient consideration and contribution to the impact of ERP systems on future enterprise structures with interoperability strategies and vice versa. In addition, since current prevailing ERP systems are not able to support virtual enterprise structures, the authors propose a contingency term called “ERPIII” in this paper to describe such future agile enterprise management systems. A summary of this research project, still in process, tries to contribute to the academia and practitioner understanding of the issues at play when ERP systems and interoperability strategies are introduced into the context of collaborative enterprise is demonstrated. Some findings are offered on how ERP systems can be used to effect dynamical changes in enterprise structures and their corresponding interoperability strategies, and these are discussed with the aid of multiple case studies.

This research study is important because of the increasing competitive and dynamic business circumstance are forcing modern companies to improve their competencies by incessantly learning and re-engineering to adapt to rapid changes around highly
complex operational supply chain in the era of globalization. Therefore, commencing with: inter-organizational (intra-enterprise) collaboration as a point of departure from conventional thinking, rather than individual companies, the authors (1) present a framework for understanding the interplay and consistencies between ERP and enterprise strategy domains; (2) Consider how current and future ERP systems may correspond to different enterprise patterns and their resultant interoperability strategies; (3) Develop the sustainable conceptual dynamic framework to guide enterprise managers for making better decisions about enterprise-wide strategy, structure transformation and technical support.

2. Literature Review

Enterprise systems (ESs) are often explained through the evolution of ERP, which have evolved from highly transaction automation and process management to highly corporate alignment and integration with rapid and dynamic “sense and respond” business model in the context of globalization and growth of virtual organization (Davenport, 2000). Al-Mashari (2003) and (Chorafas, 2001) highlight that ERP systems can be regarded as one of the most innovative developments in information technology (IT) industry, which have become the widespread integrated technical solutions for the enterprise information systems; whilst Seddon and Shanks (2000) point to the fact that ERP systems can “integrate organizational processes through shared information and data flows”.

From these perspectives, it can be seen that ERP, is, at once, a technology or
system and a component of information management strategy that are used to facilitate constant transformation of organizational structures for their survival around the fast-changing environment. This has simultaneously led to the discussions regarding “relation element theory”, “chain and network economy” and “virtual inter-organizational alliances”.

2.1 ERP vs. ERPII vs. ERPIII

In today’s global world, intelligent firms try to provide customers with goods and services faster and less expensively than their rivals. One of the keys to achieve this is to have efficient, integrated information systems (Monk and Wagner, 2009). Over the last twenty years, many firms have made significant investments in ERP suites (Bagchi et al., 2003; Stevens, 2003). The scholarly review depicts that the first generation of ERP systems act as an internal integrated information system which took shape based on manufacturing roots to seek competitive advantage (Blackstone and Cox, 2005, p. 38). These include configurable and off-the-shelf software packages to provide an integrated suite of information systems and resources which coordinate operational and management processes across the internal value chain. The latter ERP systems may also have been accompanied by a broad range of business involving sales and distribution, accounting and finance and human resources, etc. (Davenport, 1998; Al-Mudimigh et al., 2001). Traditionally, ERP systems were highly proprietary (Daniel and White, 2005), incurring a substantial amount of time and considerable financial commitment and effort to integrate or be compatible with other information techniques and systems such as Decision Support System (DSS), Enterprise Application
Integration (EAI), and Product Data Management (PDM), whilst requiring additional layers of middleware (Lee et al., 2003; Stevens, 2003). Such challenges and difficulties not only decrease the ability to integrate systems within intra-organizational boundaries, but also reduce the ability to forge dynamic intra-enterprises linkages (Themistocleous et al., 2001).

Although traditional ERP can often impel business processes re-engineering with high-levels of enterprise-wide inter-functional coordination and integration (Moller, 2005), its capabilities sometimes still cannot often fully support the e-business challenge and intensive data requirements (Chen, 2001; Songini, 2002; Moller, 2005). Traditional ERP also often fails to realize the notion of “all things to all people” and future proof users’ demands (Bond et al., 2000). By extending more modules and functionalities as ‘add-ons’, the mantra of “ERP is dead – long live ERPII” often becomes the rule for new enterprise systems development and enabled organizations (Eckartz et al., 2009). This subsequently gives birth to ERPII or ‘XRP’ (eXtended Resource Planning) systems that are defined as a business strategy to enable inter-enterprise collaboration through value chain participation. This requires companies to combine ESs with other new types of intelligent business tools consisted of Advanced Planning and Scheduling (APS), Supply Chain Management (SCM), Customer Relationship Management (CRM), Business Intelligence (BI), and Data Warehouse (DW) to reinforce both upstream and downstream chains. In parallel, by extending traditional ERP capabilities (Moller, 2005) one can put forward the concepts of collaborative-commerce (C-Commerce) and demand chain management
(DCM), etc. to optimize the market information management and reinforce business domain re-design. Furthermore, future ERP enabled enterprise systems development tends to trace transaction automation, process management and knowledge management in order to improve the current ERP gaps and achieve a “co-operation” idea based on the value network concept.

It has been suggested that widespread adoption of standardized ERP within organization may allow improved connectivity between organizations as well as have the potential to enhance the entire supply chain integration (Akkermans et al., 2003). The result of such interconnection were ERPII systems that transcend individual companies and operate at a ‘meta level’ (Daniel and White, 2005, p. 191), operating at a value chain or even the whole industry level (Davenport and Brooks, 2004). Such systems could also represent known as “Value Chain Resource Planning” (Bendoly et al., 2004), and would not only pass information, data, and knowledge between firms as current linkages can but could integrate processes and relations across all involved participants, in order to add value with extended-ESs beyond the intra-organizational boundaries.

Even if ERPII seems the current dominant IS infrastructure to support modern enterprise management, and SOA, PaaS, SaaS, and Utility are now emerging as the new IS applications to influence the consistency of multiple ERP systems (Maurizio et al., 2007) as well as offer increased flexibility, agility, efficiency and scalability for ESs with reconfiguration of SCM, EAI, etc. based on service-oriented environment
(Torbacki, 2008; Wilkes and Veryard, 2004; Candido et al., 2009). Many firms still endeavor to re-design their enterprise paradigms in order to form highly dynamic and agile units known as virtual enterprises around turbulent markets. Implementing ERP systems in such companies is an entirely different preposition than in a single company scenario. ‘Temporary existence’ and ‘Dynamic agility’ requires the corresponding ERP-driven systems to possess a flexible and web-based integrated infrastructure (Candido et al., 2009; Xu et al., 2002). Additionally, since there are some challenges derived from PaaS, SaaS, and Utility such as interface design, high risk of ROI, time consuming, granularity and culture issues, business secrecy and decomposed objectives (Candido et al., 2009; Wilkes and Veryard, 2004; Torbacki, 2008). “Virtual Enterprise Resource Planning (VERP)” and “Federated ERP” concepts merged with SOA and cloud computing technical solutions also need to be considered to realize the new enterprise structures. As the literature inadequately covers, “ERPIII” – the future of ERP systems – it is contingently defined by the authors as a flexible, yet powerful information system incorporating web-based SOA and cloud computing version, which enables virtual enterprises to offer increasing degrees of flexibility, agility and dynamic amorphousness.

The exploration of this paper begins by considering and discussing the key capabilities of three ERP generations that may consequently affect the design and governance of three dynamic intra-enterprise structures and resultant interoperability strategies. As shown by the extant literature with critical assessment and relevant quotations cited in Table 1, ERP, ERPII, and ERPIII accompanied with other related
technological tools are all expected to play significant roles in the future of distinct inter-firm relations and management strategies. Moreover, as ERPII and ERPIII are discarding their manufacturing roots and becoming truly enterprise applications or even strategic business tools in the broadest sense, it is imperative to summarize the comparisons between these three systems with respective clear definitions and potential capabilities (as shown by Table 2).

Table 1. Extant Literature of Three ERP Generations and Related IT/IS in the Future

<table>
<thead>
<tr>
<th>ERP Generations and Related IS/IT</th>
<th>Extant Literature and Key Works</th>
<th>Expected and Important Role in Future EM Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ERPII and XRPI</strong></td>
<td>Bond et al. (2000), Davenport (2000), Kodivwaj and Ven der Stappen (2000), Chen (2001), Bowserox et al. (2002), Songin (2002), Akkermans et al. (2003), Bendoly et al. (2004), Moller (2005), Shamir and Immi (2005), Sammon and Adam (2005), Beatty and Williams (2006), Eckartz et al. (2009)</td>
<td>‘Traditional ERP systems merge with new business tools can enable inter-enterprise collaboration’ (Bendoly et al., 2004; Moller, 2005; Eckartz et al., 2009) ‘ERP, POA, and BAI integration will gain both internal and external processes connection’ (Moller, 1999; Lee et al., 2003)</td>
</tr>
</tbody>
</table>
Table 2. A Comparisons between ERP, ERPII, and ERPIII

<table>
<thead>
<tr>
<th>Element</th>
<th>ERP</th>
<th>ERPII</th>
<th>ERPIII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role of the ERP systems</td>
<td>Enterprise optimization and integration</td>
<td>Value chain participation / e-commerce enablement</td>
<td>Virtual value chain, value network, and open source</td>
</tr>
<tr>
<td>Business scope/domain</td>
<td>Manufacturing and distribution, automatic business transactions</td>
<td>Relevant sectors/segments with upstream and downstream</td>
<td>All sectors/segments, strategic alliance, network collaboration</td>
</tr>
<tr>
<td>Functions addressed within the domain</td>
<td>Manufacturing, sales and distribution, and finance process</td>
<td>Cross-industry industry sector and specific sector processes</td>
<td>Multinational and global industry sectors and information exchange</td>
</tr>
<tr>
<td>Processes required by those functions</td>
<td>Internal, hidden, intra-enterprise boundary</td>
<td>Externally connected, ego-network, inter-enterprise relations</td>
<td>Externally connected, open network to create borderless enterprise</td>
</tr>
<tr>
<td>Information system architecture</td>
<td>Web-aware, closed, monolithic, PDM, CAD are involved</td>
<td>Web-based, componentized, open, EAI, SCM, CRM etc. are involved</td>
<td>Web-based communication, service-oriented architecture</td>
</tr>
<tr>
<td>The way data is handled within those IS architectures</td>
<td>Internally generated and consumed between inter-functional departments</td>
<td>Internally and externally published and subscribed with joint ventures</td>
<td>Externally exchange via open source and cloud computing</td>
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</table>

Definitions of three ERP Generations with Typical Capabilities

**Traditional ERP**

Traditional ERP is a manufacturing software system for business management, encompassing a variety of modules to support different functional areas. It also facilitate transparent integration of those modules, providing information flow between cross-functional within the enterprise.

- Consistent and accurate different systems and data sources
- Time saving, enterprise-wide control and decision making
- Eliminate bureaucracy

**ERPII**

ERPII is a business strategy and a set of industry-domain-specific applications deliver on the integrated value chain, which build supplier, customer, and shareholder value by enabling and optimizing business network, inter-enterprise relations, and collaborative operational processes.

- Reinforce both suppliers and customers sides
- Efficiency internal and external operations and collaboration
- Bring innovative and effective corporate performance management

**ERPIII**

"A flexible and powerful information system incorporating web-based SOA, cloud computing version, SaaS, and SLA which enables virtual enterprises paradigm and virtual value network to offer increasing degrees of flexibility, agility and dynamic amorphousness."

- Quick response to external dynamic markets
- Flexibility, efficiency, and agility
- Could computing accompany by SLA and other policies rules around an open environment

2.2 Anatomy of New Enterprise Structures (VIE, EE, and VE)
Highly competitive and rapidly changing environment, globalized economic conditions, and well-informed and demanding customers urge more and more companies of various sized categories to get involved in activities that are outside the boundaries of the traditional companies (Binder and Clegg, 2006). This is in order to embrace a growing opportunity to see themselves as potential business partners for various business networks, collaborative arrangements (Achrol and Kotler, 1999), and joint ventures. Such relationships are referred to in this paper as a pattern of intra-enterprise behaviour. Tencati and Zsolnai (2009) state the strength and sustainability of enterprise come from their ability to fit within the environment, social, and culture context in which they function, while Binder and Clegg (2006) claim “the success of collaborative enterprise management depends on the ability of companies to intermediate their internal core competences into other participating companies’ value streams and simultaneously outsource their own peripheral activities...”. These comments indicate that enterprise management strategies now rely much on the performance of its partners in the virtual value chain rather merely look into its internal operations (Choy et al., 2005). Begin with the perspective of IS transformation in different enterprise forms and strategies, the authors will specifically focus on three proposed enterprise management paradigms known as VIE, EE, and VE, as well as investigate how they can be planned for by three generations of ERP systems, in order to achieve inter-operation in success.

Vertically integrated enterprises (VIE) that operate close to the traditional large single integrated multi-functional firm (large scale of economy and tall hierarchy) (Lynch,
2003) have been described 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). Tall hierarchy, self-control and industrial dominance are major elements existing inside such enterprise management model. VIE normally go through a way of increasing a firm’s value-added margins for a particular chain of processing from ultra-raw materials to ultimate consumers (Harrigan, 1985). This is to decide upon the direction (upstream and downstream) and limits of the extensions, which aims at internally balancing potentials and capacities and at externally maximizing the company’s manoeuvrability in front of its partners (Vallespir and Kleinhans, 2001). As a result, a set of benefits and competitive advantages such as cost reductions by integrating economies and improved coordinated activities (Harrigan, 1983; 1984), product quality protection by creating product/service-differentiation and building entry barriers (Rothaermel et al., 2006), as well as rapid response with technological adaptations to changing market demands in certain industries (Richardson, 1996) can be gained. Additionally, some scholarly arguments suggest that ‘make-or-buy’ decision (Vallespir and Kleinhans, 2001), strategic outsourcing and alliances (Rothaermel et al., 2006; Arya et al., 2008), and other alternatives (Harrigan, 1984) could be merged with VIE strategy to synergistically increase and optimize the firm’s product portfolio, success, and performance, which can contribute to a competitive advantage in highly dynamic market (Brown and Eisenhardt, 1997).

While the determination of collaborative enterprise boundaries appears to be mediated
by industry structure and firm engage-abilities (Argyres, 1996), companies can alter their value chain domain based on IS development and managerial discretion to address more powerful core competences within the inter-organizational context.

Considerable disadvantages and competitive dangers exist (e.g. increased cost for intra-vertical integration, burden of excess capacity, losing information from suppliers and sellers, etc.) by conducting vertically integrated enterprise management structures. These uncovered newly viewed intra-enterprise structures named ‘extended enterprises’ (EE). EE is defined by Davis and Spekman (2003; 2004) as “the entire set of collaborating companies…which bring value to the marketplace…” Also, this term is interpreted as “a kind of enterprise which represented by all parts of organizations, customers, suppliers and sub-contractors that engaged collaboratively to the end users” (Browne and Zhang, 1999) or “a business value network where multiple firms own and manage parts of an integrated enterprise” (Lyman et al., 2009). Accordingly, the paradigm of extended enterprise often encompasses just-in-time (JIT) supply chain logistics (Sutton, 2006) and collaborative innovation (Owen et al., 2008), working with data warehouse interoperability (Triantafillakis et al., 2004) and SCM, and focuses on its core business and technical activities, while outsources non-core capabilities from outside suppliers and third parties (Browne and Zhang, 1999; Thun, 2010).

As VIE, or even EE cannot manage to successfully follow the turbulent and unpredictable market behavior of today in all required dimensions, new approach and enterprise paradigms/strategies are requested and recognized as virtual enterprises
(VEs) (Martinez et al., 2001). Generally, VE is described as the fluid, flexible combination of components of one or more entities/businesses assigned by decomposed specific objectives to deliver value to a market (Davenport, 2000). Alternatively, VE could be understood as an innovative network from which temporary alignments are formed. Thus, this kind of inter-firm relationship can facilitate agile manufacturing (Cho et al., 1996; Sharp et al., 1999) and manage operation in which ICT plays a major role (Hyvonen et al., 2008), and deal with changing dynamic market needs (Madu and Kuei, 2004).

Browne and Zhang (1999, p. 35) summarize that the extended enterprise and virtual enterprise can be seen as two complementary enterprise strategies as their similarity lies in the fact that they both pursue inter-firm partnerships in order to achieve business success in a very competitive environment. The main difference is represented by the ‘temporary’ and ‘dynamic’ nature of one (i.e. VE) versus the relative stability of the other (i.e. EE). Moreover, as management re-engineers the firm for responding well to uncertain business environment, the virtual enterprises (VE) tend to replace the vertically integrated organization (Daniels, 1998) as virtual enterprises are “opportunistic aggregations of smaller units that come together and act as though they were a larger, longer-lived enterprises” (Goranson, 1999) for the purpose of increasing the market share and benefits. In the light of above discussion regarding VIE, EE, and VE, the authors sum up their comparisons between one another (as shown by Table 3) for enabling the latter hypothesis establishment.
### Table 3: A Comparisons between VIE, EE, and VE

<table>
<thead>
<tr>
<th>Key Element</th>
<th>Vertically Integrated Enterprise (VIE)</th>
<th>Extended Enterprise (EE)</th>
<th>Virtual Enterprise (VE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core capabilities</td>
<td>Mature and well accepted, well-structured and strong control</td>
<td>Semi-mature with pilot experience, comprehensive for innovators</td>
<td>Quick respond to the changing market and environment</td>
</tr>
<tr>
<td>Strategic aims</td>
<td>Stronger-long term objective</td>
<td>Stronger-medium-long term objective</td>
<td>Stronger short-term objective</td>
</tr>
<tr>
<td>Partnership purposes</td>
<td>Long-term co-operation for sustain the competitive advantages</td>
<td>Medium-long-term collaboration</td>
<td>Temporary team-working for project or products</td>
</tr>
<tr>
<td>Organization stability</td>
<td>Extremely with all hierarchy and inflexible environment</td>
<td>Stable relatively across the product value chain</td>
<td>Dynamic organization with core competences</td>
</tr>
<tr>
<td>Duration of partner relationships</td>
<td>Forseeable as permanent as long as competitive</td>
<td>Medium-term depend on mutual trust</td>
<td>Temporary and dynamic</td>
</tr>
<tr>
<td>Organization type</td>
<td>Unity of command control, Concern more on scales of economies</td>
<td>Product value-chain based</td>
<td>Frequently project or niche market based</td>
</tr>
<tr>
<td>Co-ordination of partnership</td>
<td>Always the senior manager supervises the relationship with the partners</td>
<td>Often the manufacturer or prime contractor supervises the partnership</td>
<td>Often the broker supervises the cooperation</td>
</tr>
<tr>
<td>Operational challenges</td>
<td>Legacy system transferring approaches (e.g. big bang vs. incremental ways)</td>
<td>The synergistic among the core competencies, Compatibility around partners and IS/IT</td>
<td>Dynamic operating and unpredictable environment, Psychological issues, Low trust leads to high risk</td>
</tr>
<tr>
<td>Risk degree</td>
<td>Comparative low</td>
<td>Moderate</td>
<td>Intense high</td>
</tr>
<tr>
<td>IS/IT facilitators</td>
<td>In-house development of proprietary systems with traditional ERP system for intra-integration</td>
<td>Advanced IS/IT, ERP merged with SCM, CRM, DSS, EAI, BI, etc.</td>
<td>Sophisticated ICT tools, SOA, SaaS, SLA, cloud computing, Web-based technologies</td>
</tr>
<tr>
<td>Main features</td>
<td>External trust is low, inflexible, high overhead, Large scale of economy</td>
<td>Hollow the corporation, High inter-integration via trust and loyalty</td>
<td>Low overhead, Flexibility, agility, temporary and dynamic, No hierarchy with rapid changes</td>
</tr>
</tbody>
</table>

#### 2.3 Hypothesize the Relations between ERP and Enterprise Structures

The above comprehensive insights covering ERP, ERPII, and ERPIII capabilities, as well as VIE, EE, and VE characteristics have revealed the potential correlations for linking these two disciplines. Therefore, this chapter provisionally hypothesize the relationships among three ERP systems generations and three intra-enterprise paradigms/strategies via inter-operational activities (as shown by Figure 1), which tend to be proved and developed by latter two empirical case studies and discussion in
order to induce the final sustainable dynamic framework.

Figure 1. Hypothetical Relationships between ERP and Enterprise Strategies.

2.4 Interoperability Strategies in Virtual Value Chain

Nowadays, networked business encounters recurrent difficulties due to the lack of
interoperability between enterprise systems. This would particularly occur within the context of collaborative networked environment (CEN) as the integration and interoperability can enhance the competitive advantages of the CNs and their member organizations (Chituc, et al., 2008). Although a body of literature has concerned enterprise integration and inter-operational activities with available ICT tools and new open dynamic architectures, it is still lack of the considerations about how interoperability strategies can be achieved with newly ERP systems within the enterprises from strategic management perspective rather than technical notion.

The virtual value chain (VVC) (Rayport and Sviokla, 1995; 1996) is a business model describing the dissemination of value-generating information services throughout extended or virtual enterprises. Alternatively, this novel concept is known as a “Value Net” which re-designs the business using digital supply concepts to achieve both superior customer satisfaction and company profitability. In the virtual value chain (VVC), information has become a dynamic element, rather than a support element in the formation of a businesses’ competitive advantage. This transformation produces new benefits and partnerships for suppliers and consumers, which also goes for the manufacturing field. Particularly, “virtual” indicates that information itself can be a source of value and create knowledge (Bhatt and Emdad, 2001).

The proposed “Dynamic Enterprise Reference Grid” (DERG) model investigates and indicates that the prevailing type of core competence would significantly affect the design and management of the emergent enterprise structure (Figure 2) (Binder and Clegg, 2006). Specifically, the DERG summarizes four different dominant current and future types of enterprise patterns and core competencies and their engage-ability. Each of these enterprise structures is considered to be a ‘dynamic equilibrium’, and one amongst them may change into another as a result of a changed predominance in the type of core competence that it is built upon (Binder and Clegg, 2006). This is a two-way interdependent relationship between each respective pairing.

![Dynamic Enterprise Reference Grid](image.png)

**Figure 2. Dynamic Enterprise Reference Grid**

Limitations of DERG exist as it only focuses on the conspicuous attributes of enterprise structures associated with how their core competencies influence the corresponding enterprise design and management, rather than directly exploring IS strategy. This chapter refers to the “IS formulation strategy transformation” model (Galliers, 1994) simultaneously as Galliers’s (1994, p. 60) model (Figure 3) illustrates the changing perceptions of IS strategy shifting from technological efficiency to business competitiveness and collaboration.

![Figure 3. IS Formulation Strategy Transformation](image)

Comparatively, Figure 2 demonstrates four distinct structures based on the enterprise management perspective, and Figure 3 presents the associated IS transformation.
Even if they look similar and remark on the homologous issues, they are different and cannot be superimposed directly one-on-one. Presently there is a gap in practice and theory referring to how ERP systems satisfy these three enterprise management structures - which is why this research is investigating and addressing it through the following case studies and conceptual induction.

4. Research Methodology

The primary focus of this study is the interplay between ERP systems, inter-operational activities, and emerging enterprise structures. Thus, the research methodology was designed to develop a preliminary conceptual framework to explore and understand how governing ERP in inter-company collaboration through interoperability strategies in dynamic unpredictable circumstances. This has been investigated using multi-case studies via the narrative research approach, and two are presented as examples in this paper. The purposes are to (i) evaluate the companies Zoomlion and Lanye based on the “Collaborative Enterprise Governance” model (Binder and Clegg, 2007), (ii) seek reasons that result in the corporate innovation strategy, and (iii) assess ERP systems engage-abilities residing in different suggested inter-enterprise structures and rely on the “IS formulation strategy” cycle. These were addressed through the following three major subtopics: mapping and designing the cases at different evolutionary stages, determining the suitable enterprise management structures (i.e. governance strategy) for the engagement with the value members according to both exogenous and endogenous factors, and managing the collaborative
enterprise via available ERP systems. Implications derived from Zoomlion and Lanye case studies were then used to refine the “DERG” framework and prove some tentative propositions on managing ERP systems development and intra-enterprise strategies, in order to ultimately achieve agile and flexible inter-operation.

4.1 “Collaborative Enterprise Governance” Model

“Collaborative Enterprise Governance” (CEG) model (as shown by Figure 4) provides a methodological approach which considers the “enterprise” to be made up of different modules (parts of companies). Each module is built around highly specific competencies and is integrated with other modules using less specific capabilities and resources (Binder and Clegg, 2007). The tools used in this approach are generally described into four phases. Steps 1 uses the Enterprise Matrix to map enterprise modules, steps 2 uses the theories discussed previously to see which sort of enterprise structure is best suited to, step 3 uses the Dynamic Enterprise Reference Grid (DERG) framework to predict where the enterprise might be heading, and step 4 assesses the options to make available changes. This methodology is cyclical, and therefore, the final stage will start the entire approach again to repeat the above steps.

In the light of foregoing arguments and hypothetical diagram between ERP and inter-enterprise strategies, CEG model was primarily applied to analyze and describe different enterprise structures of Zoomlion and Lanye as well as determining their key value members at different evolutorial stages. This model also reinforces the understanding about how ERP systems can mainly influence and satisfy their
corresponding inter-enterprise management paradigms and vice versa as the authors
would simultaneously explore the ERP systems development within these two cases
via a narrative approach.

Figure 4. “Collaborative Enterprise Governance” Methodology

<Source from: Binder and Clegg, 2007>

5. Empirical Case Studies

The empirical materials (i.e. primary qualitative data) derived from two cases are
gathered from action/ethnographical research at Zoomlion and Lanye. In detail, ease
case study involved separate semi-structured interviews of people in three
organizational roles: the Chief Executive Officer (CEO), the Chief Information
Officer (CIO), and the Supply Chain and Sales Manager. Questionnaire survey was
only conducted to the staff of relevant functional departments covering market strategy, technical platform and information system divisions, and ERP project teams.

5.1 Case A: Zoomlion Case Study

Company Profile

Zoomlion was founded as the Heavy Industry Science and Technology Development Co., Ltd in 1992. Its headquarters is in Changsha and main manufacturing plant in Mainland Chain. Initially, Zoomlion was a hi-tech public company engaging crane and other machines for manufacturing and construction fields, with nearly 20,000 employees. At present, Zoomlion’s production line has covered both China and western regions and the company has become a multi-national based manufacturer of consumer products. Also, Zoomlion has its own international management systems for technical development, manufacturing processes and logistics, and a strong sales network and perfect service system covering the whole domestic market, and extending to the oversea market. Zoomlion has continued to achieve rapid development by leaps and bounds with its vision of building up a knowledge-based learning enterprise, and producing top quality and innovative products with enhanced services to the end users on time.

Shifting from Defunct Enterprise into Horizontal Integration and Vertically Integrated Enterprise

The predecessor of Zoomlion was founded on a high-tech academic institution, which could be considered as a “defunct enterprise” without any direct profitable purposes.
Along with transforming from simple academe into real commercial manufacturing enterprise, the top management realized that ‘informationization’ would be critical to replace the physical data flow within the entire operational processes. Thus, IT applications were adopted gradually but with bounded utilization. In parallel, Zoomlion merged other peer companies that supplying logistic and ancillary products/services in order to decrease the sales cost and raise the products’ differentiation. Such kind of corporate-level strategy was achieved by horizontal integration (HI).

After combined some competitors in the same business industry, the Zoomlion’s enterprise structure and transactions had transformed into a large scope of economies. This type of enterprise management not only decreased the competitive rivalry, but also reinforced Zoomlion’s bargaining power to both suppliers and consumers. Following the steps of CEG model, the authors applied the Enterprise Matrix (which uses ‘enterprise modules’) to assist mapping out cross-departments within the Zoomlion manufacturing company (as shown by Table 4). Simultaneously, the ‘icons’ (i.e. the triangular shapes) were involved to show whereabouts each value member is contributing to the value chain. This tool helped to optimize the whole enterprise operations via the allocation of the most suitable value members (e.g. prime contractor, purchasing, design and manufacturing divisions, after-sale service, etc.) to process stages and tasks (e.g. crane manufacturing and development) of the value stream based on their value proposition to the company.
As cultural diversity, staff turnover (endogenous factors), enormous maintaining expenditure (exogenous factor), etc. occurred unexpectedly, which were induced by a number of piecemeal systems and complex redundant documentations, Zoomlion decided to launch ERP systems to revamp its outdated IT infrastructure for addressing an integration-focused enterprise paradigm. In the same way, the ERP systems facilitated Zoomlion to re-design its business processes dramatically focusing on the high-value departments via the pilot Zoomlion Operations Re-engineering (ZORE) project. The new business model was viewed as a tool by which Zoomlion could describe how it wished to conduct its internal operational processes and IT strategy.
with external customers and suppliers.

Binder and Clegg (2007) state that the number and type of enterprise engagements for any one company is closely aligned with the value proposition of its competencies and the capability of deploying them within collaborative activities of the enterprise. Table 4 consequently implies and determines that the most appropriate EM paradigm for Zoomlion at this stage is vertically integrated enterprise since the largest contributions are stem from the value members who engaged around the intra-firm. On the other hand, accompany by the substantial impact and strategic changes derived from ERP systems being aware, Zoomlion had been involuntarily realizing the VIE structure which was potentially mature and permanent with extensive resource and low transaction costs/specific assets. High degree of intra-integration regarding both cross-functional divisions and diverse resources would lead to high quality of deliverables and investment assets, as well as combine Zoomlion in buyer-seller relationship.

Shifting from Vertically Integrated Enterprise into Extended Enterprise and Virtual Enterprise

Since the industry-specifics of Zoomlion determined that its ERP systems adoption must follow the holistic value chain, new challenges included fast-changing techniques, unpredictable marketing (exogenous factor), and re-intermediation and ownership of assets (endogenous factors) were encountered. Therefore, establishing new corporate-level strategy was imperative. For this purpose, the senior management
re-allocated the heterogeneous value members (as shown by Table 5), which is dependent upon their engage-abilities and contribution to fulfill the final missions via the collaborative value stream. Also, the scope of the member classification tended to go beyond the Zoomlion’s organizational boundaries (e.g. joint partner, suppliers and customers, etc.), rather than merely stayed in the interior. These features of the collaborative activities indicate that the most appropriate enterprise management form for Zoomlion at this stage is the extended enterprise due to its value chain (supply network) spanning the whole product life cycle across the intra-enterprise and multi-organizational boundaries.

Table 5. The Enterprise Matrix for Zoomlion Manufacturing Company (Transforming from VIE into EE/VE)
The asset specificity of Zoomlion’s information system was now working against exogenous competitive forces and the company was endeavoring to change its IS strategy with ERP systems application from merely issue-based problem solving into business tactic seeking. This mission was realized by Toyota’s lean management concepts and strategically outsourcing non-core capabilities from other suppliers and third parties in the same heavy industry (e.g. the CIFA manufacturing firm). Moreover, the company ranked the suppliers and consumers in the light of their potential values in order to facilitate its business performances across the entire value chain. In this way, Zoomlion turned to be a quasi-permanent extended enterprise pattern with medium degree of inter-integration, while involved moderate lean and agile resources as well as alliances with other unities within a ‘virtual value chain’ that accelerated by SCM and CRM.

In spite of setting up collaboration, the senior managers of Zoomlion neglected that great value stemmed from such partnerships, which would poorly sustain the permanent collaborative venture and long-terms supplier-customer relationships. Hence, the authors recommend that Zoomlion could test its partial divisions into virtual enterprise structure, which would make the company maximize its flexibility and adaptability for coping with a quick respond environment via cost-effectiveness, product uniqueness, global supply chain optimization, and short-term temporary seamless relations with industrial partners. In this case, ERP systems can be used as another type of weapon with SOA and web-based technologies.
The Transformational Route of Zoomlion’s Enterprise Strategies and ERP Development

Figure 5 and Figure 6 show the corporate innovative roadmap and transformational route between different enterprise strategies via ERP systems development at Zoomlion. Particularly, Zoomlion initially shifted from ‘enterprise-defunct’ form with limited IT usage into horizontal integrated enterprise but still focused on a single company conformation concerning economic investment, in-house data flow and market bargain power. By launching ZORE project and traditional ERP systems through an incremental way, Zoomlion’s enterprise structure entered into VIEs which represents the origin of multi-company patterns. Traditional ERP systems work inside this EM form to obtain the high current core-competence with newly IT infrastructure and high intra-integration of functional divisions and resources. Afterwards, along with the inter-enterprise strategy evolution from VIEs to EEs, ERP system has synchronously developed into ERPII to assist company not only gain the current competitive advantage through strategic outsourcing and mutual partnerships, but also for the future leading edge. Finally, for the purpose of improving coordination and interoperability to be more closely and effectively, as well as coping with new crucial network challenges, Zoomlion might morph into VE paradigms accompany by ERPIII systems and SOA, PaaS, SaaS, etc. tools.
Zoomlion case study only represents factors regarding the transformation between VIE and EE, as well as some assumptions about VE with ERP systems adoption.
Other factors are still being substantiated through other case studies still in progress.

Besides the Zoomlion case study, this chapter will present another completed case – Lanye in the next subsection, which also investigates and proves the possibilities of managing ERP and inter-enterprise strategies within one platform.

5.2 Case B: Lanye Case Study

Company Profile

Lanye is a rapidly changing multinational company, which has expanded its supply chain from single company with in-house manufacturing into other organizations all around world along with its IT and ERP systems development.

Shifting from Traditional Manufacturing via Mergers and Acquisitions into a Vertically Integrated Enterprise

Different from Zoomlion, the precursor of Lanye – The Heavy Industry Company – was a concrete manufacturer, which is viewed as a traditional manufacturing firm with a certain amount of commercial active engagement and formal trading rather than an “enterprise-defunct” organization. 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 growth, the senior management decided to bring in a set of advanced technical tools such as computer-aided design (CAD) and office automation (OA) to change the customary physical business processes. Meanwhile, LANYE adopted horizontal mergers and acquisitions (MandAs) investment activities for pursuing operating and financial
synergies in its production, marketing, and managerial experience. The carrying out of MandAs resulted in value creation, internal and external geographical expansion, as well as augmentation and diversification of product portfolios.

After merged three competitors operating in the same industry and on the same industry level through the stock acquisitions strategy, the Lanye’s enterprise paradigm had shifted into a larger size of manufacturing firm with more complexity, increased its economies of scale, and boomed the business. Similarly, the authors used the Enterprise Matrix to map out cross-divisions and value members within the Lanye and its entire value chain (as shown by Table 6). This approach not only classifies the grade and significance of the most valuable members (e.g. raw material supplying, design and manufacturing department, etc.) involved in contributing to the enterprise transactional operations, but also clarifies each stage and collaborative mission (e.g. concrete and mixer design and realization) to fulfill the ultimate product across the firm’s value stream.

Table 6. The Enterprise Matrix for Lanye Manufacturing Company (Transforming from Horizontal MandAs into VIE)
As the targeted companies are relatively small compared to Lanye, limited actions and input were laid out to restructure business processes and afterwards led to culture differentiation with desire to preserve own culture, existing routines disruption (endogenous factors), huge amount of MandAs expenditure (exogenous factor), etc. Simultaneously, Lanye decided to implement vertical MandAs via combing the firms that operate in different stages of the same industry to replace the horizontal strategy, in order to reinforce its competitive advantages and asset investment efficiency. These factors compelled the firm to start-up ERP project to repair the improper information systems and facilitate the real intra-processes integration. According to business strategy, company size, and operational performances on the whole supply chain, Table 5 indicates that the most suitable EM form for Lanye in this phase is vertically...
integrated enterprise, while ERP systems can subsequently help the firm to achieve the high degree of intra-integration among the cross-functional units and promote the organizational structure re-engineering.

**Shifting from Vertically Integrated Enterprise into Virtual Enterprise**

During the actual and post vertical integration processes, the top managers spent too long to determine which roles and people should stay, while they had not established available relationships to bring separate entities together. Also, the communication to all constituencies including employees, suppliers, customers, and shareholders were not regarded adequately. These endogenous factors forced Lanye to re-conform and streamline its internal diverse resources and assets. On the other hand, the exogenous factors consisted of global economic integration, IT/IS improvement, and transporting costs jack-up occurred unexpectedly. Hence, it was necessary to set up new strategic alignment to combine business, technology, and cross-culture. Aim at this, the senior management re-assigned the value member classification in terms of the degree of their contribution and engage-abilities for completing the respective activities on the collaborative value chain (as shown by Table 7), in order to achieve an agile or even leagile manufacturing with quick responses to the global marketing demands.

**Table 7.** The Enterprise Matrix for Lanye Manufacturing Company (Transforming from VIE into VE/EE)
Once the new organizational structure and operational business processes made official, integration and inter-collaboration by gaining the new technologies and capabilities were the true key to the success. Along with changing the previous IS strategy with traditional ERP systems functionalities, the holistic value proposition of Lanye had transferred from issue-based problem solving into goal seeking strategy accelerated by IT tools (‘bottom-up’) rather than business-driven (‘top-down’). Table 7 determines that the most appropriate EM structure for Lanye in this phase is virtual manufacturing enterprise. Particularly, each functional unit (e.g. joint partner, raw material supplying, logistics division, etc.) extended to the international-bound rather than merely Chinese region. The cooperative tasks were realized by new ERP applications with SCM and CRM systems accompany by Product Data Management.
(PDM), GPS with Alutec consulting company, and Virtual Private Network (VPN). In this condition, Lanye turned to be a new emerging manufacturing paradigm with operational agility and flexibility for infrastructure commercially, technically, and organizationally via its ‘virtual value chain’.

Although VE increased the efficiency of production, logistics, sales, and monitor with lower cost, and improved the management across the inter-departments boundaries, the asset and industry specificity of Lanye constrained the substantial restructuring and reorganization. Meanwhile, the headquarters often used its power to influence and dominant the acquired firms and joint partners, which might cause potential risks around the dynamic and unpredictable environment. Consequently, the authors 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.

*The Transformational Route of Lanye’s Enterprise Strategies and ERP Development*

Figure 7 shows the corporate innovative roadmap and transformational route between different enterprise strategies via ERP systems development at Lanye. Comparatively, the evolution path in Lanye case (as shown by Figure 7) indicates that VIEs can not only directly shift to EEs with traditional ERP systems, but also directly morph into VEs with ERP III or some other IS architecture (e.g. Virtual Private Network).
Lanye case study only represents factors regarding the transformation between VIE and VE, as well as some assumptions about EE with ERP systems adoption. Other factors are still being substantiated through other case studies still in progress. These two cases support the new ideas and dynamic framework that are induced below for managing ERP and inter-enterprise relationships concurrently.

6. Discussion of Novel Dynamic Sustainable Conceptual Framework for ERP Systems and Inter-Enterprise Management

6.1 ERP Systems Engage-abilities in VIE

Since VIEs are highly flexible with self-control, industrial dominance, and proprietary IS (Binder and Clegg, 2006) running applications such as in-house logistic would face uncertain demands and unnecessarily constrained capabilities. Meanwhile, the VIE
pattern often serves large single organizations or manufacturing firms, which requests ERP systems architecture to be built upon real-time information with a desired level of sales and processes integration. Also, social commitment and risk management for implementing the ERP initiatives need to be practiced carefully in response to the uncertainty and equivocally complex environment.

6.2 ERPII Systems Engage-abilities in EE

Shifting from ERP into ERPII, the new systems’ capabilities have been extended to undertake the paradigm of EE. First of all, ERPII systems could re-engineer the supply chain and enable a high level of operational process integration. Differing from VIE, this “seamless supply chain” extends towards suppliers and customers rather than being constrained by organizational boundaries. Secondly, as an EE is an entire set of collaborating alliances for sharing common goals and creating superior values, moderate supplier-customer relationships and joint venture partnerships are inevitably and they can be managed efficiently via SCM/CRM that act as integral components of the virtual value chain. With such smart applications, information from both upstream and downstream could be exchanged by ERPII for improving strategic alignment with competencies. However, in view of the EE’s essence, this type of cooperation is still pursuing a self-centred approach to IS strategy rather than virtual intercommunication.

6.3 ERPIII Systems Engage-abilities in VE

VE key characteristics of ‘temporary existence’ and ‘agility’ require corresponding
ERPIII systems to contain a flexible, agent-based ICT infrastructure, web-based architecture, and computer integrated manufacturing (CIM) system, and intelligence management based on client/server integrated systems (Xu et al., 2002). As a VE is an entity with low volume and high diversity inter-collaboration through business process management must be quick and dynamic. This can be achieved by ERPIII systems with supplemental SOA cloud computing versions and internet compliant architecture such as VERP, Dynamic Enterprise Model (DEM) and Business Application Programming Interface (BAPI). Moreover, psychological trust and conflict issues must be taken into account when applying ERPIII systems. EEs and VEs tend to be served by multi-organizational integrated information systems to gain collaborative competitive advantage.

6.4 Proposed “ERPIII” System

ERPIII applications integrate enterprise operations within and across enterprise legal entities, or company codes. By extending supply functionality to external enterprises (generally vendor-affiliated companies or enterprises) for reducing cost, improving supply chain efficiency, and performing collaborative innovation based on ERPII applications, ERPIII enterprises will go to the next level of integrating the traditional ERP and ERPII functionalities to include customers and the sales side of the marketplace in general. The end state of the ERPIII enterprise would include a dialog between customers/potential customers, the ERP organization, and the extended supply chain with SOA, PaaS, SaaS, and Service Level Agreement (SLA) tools so that even suppliers would engage in the sales side of the marketplace. Moreover, ERPIII
will create the “borderless enterprise” by bringing together a host of technology sources such as collaboration techniques, social media, internet-based technologies, could computing, smart information integration and synthesis, etc.

6.5 Novel Dynamic and Sustainable Conceptual Framework

Figure 8 shows how the above ideas can be combined in the context of global value chain and supply chain. These proposed enterprise types do not result from different strategies, but are actually part of the same overall business objective focused on inter-company cooperation. However, at different times and circumstances in its lifecycle the firms may require preferable structures with corresponding ERP systems to satisfy their requirements. At present this is a proposal ’straw man' framework based on the CEG model, literature review on ERP developments and two initial case studies. This is work in progress and further details about the concept testing, theory developing and data can be provided by the authors.

As Figure 8 is a conceptual framework which not only reveals ERP, ERPII, and ERPIII systems engage-abilities within three different inter-enterprise strategies and structures respectively, but also demonstrates a cyclical transformation amongst one another. This transformation with empirical examples stem from the above two cases are able to give and explain how and why enterprise strategies changes can be affected and realized by ERP systems development.
Figure 8. Novel sustainable conceptual framework for managing ERP systems development and dynamic enterprise strategies

Based on the explanation of empirical data and postulated propositions accompany by conceptual interpretation, Table 8 structures the descriptions to break down Fig. 8 into small chunks for deeply explaining the ‘static’ and ‘dynamic’ components of the above novel sustainable conceptual framework, as well as providing a dynamic views of inter-enterprise design and management depend on ERP systems development.

Table 8. Provenance and Descriptions of the Novel Dynamic Sustainable Conceptual Framework
<table>
<thead>
<tr>
<th>Q1</th>
<th>Defunct enterprise with limited IT/IS efficiency</th>
<th>Static</th>
<th>Dynamic</th>
<th>Theoretical description</th>
<th>(ii) Most relevant propositional finding</th>
<th>(iii) Empirical examples from research</th>
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<td><strong>No active engagement in a current collaborative activity; no degree of integration</strong></td>
<td><strong>No profits purposes</strong></td>
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<td><strong>ERP systems not exist</strong></td>
<td><strong>IT/IS implementation</strong></td>
<td><strong>Fixed single company conformation</strong></td>
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<td><strong>IT/IS usage is limited</strong></td>
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<td><strong>IT driven strategy via ’bottom-up’ approach</strong></td>
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<td><strong>Company focus on solving business-based problems</strong></td>
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<td>Q2</td>
<td>Vertically integrated enterprise (VIE) with G 1 ERP</td>
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<td><strong>Self-control, industrial dominance and proprietary request ERP to be built upon real-time information</strong></td>
<td>After launch ERP systems with ZOE project. ZOOMLION has addressed high level of intra-integration. Also, the largest contributions are from value members who engaged within intra-firm scope</td>
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<td><strong>Potentially permanent collaborative partnerships with high degree of intra-integration</strong></td>
<td><strong>High degree of functional units integration involving sales and intra-business processes</strong></td>
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<td><strong>Traditional ERP promotes BPR and high level of intra-integration between functional divisions</strong></td>
<td><strong>Undertaking social commitment and risk management</strong></td>
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<td><strong>ERP is applied effectively with effectiveness for current business-based problems</strong></td>
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<td><strong>Business strategy is driven by ’top-down’ approach</strong></td>
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<td><strong>Extensive external resource and low transaction cost</strong></td>
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<td>Q3</td>
<td>Extended enterprise (EE) with ERP II</td>
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<td><strong>ERP pre-engineers SC</strong></td>
<td>ZOOMLION carried out new business strategy for relocating its value members. Joint partners, suppliers, customers, and even competitions are involved. Meanwhile, lean management concept and strategic outsourcing from CIFA are applied by ZOOMLION</td>
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<td><strong>More stable, strategic, close and permanent collaborative venture focused on mutual relationships</strong></td>
<td><strong>ERP could enable high level integration of operational processes</strong></td>
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<td><strong>ERP II systems develop joint venture partnerships via ’Virtual Value Chain’ concept</strong></td>
<td><strong>Seamless supply chain</strong></td>
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<td><strong>ERP II is applied skill with effectiveness but for future opportunities</strong></td>
<td><strong>Moderate supplier/customer relationships and collaborative alliances are managed by SCM/CRM systems</strong></td>
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<td><strong>Enterprise strategy changes into goal seeking rather than resource-based</strong></td>
<td><strong>Strategic alignment of upstream and downstream can be achieved by ERP II</strong></td>
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<td><strong>Medium transaction cost with lean resource base</strong></td>
<td><strong>Self-centred approach ‘core radiation’</strong></td>
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<td><strong>BPR: form medium degree of intra-enterprise integration</strong></td>
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<td>Q4</td>
<td>Virtual enterprise (VE) with ERP III</td>
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<td><strong>ERP III contains a flexible, agent-based ICT architecture</strong></td>
<td>In terms of holistic value proposition, LANIE has extended its business scope into international board rather than Chinese region. The cooperative tasks are realized by new ERP applications with SCM, CRM, PDM systems. It also gets ALUTECH consulting company to be involved to set up VPI, in order to obtain more flexible and agile operational infrastructure and IT/IS</td>
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<td><strong>Flexible, agility, loose, temporary and dynamic project based collaborative venturing</strong></td>
<td><strong>Inter-collaborative through business process management must be quick and dynamic</strong></td>
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<td><strong>ERP III systems accelerate quicker and more dynamic business network communication</strong></td>
<td><strong>Psychological issues such as trust and conflict should be taken into account</strong></td>
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<td><strong>Assisted by SOA, cloud computing, PaaS, SaaS and other web-based tools</strong></td>
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<td><strong>High risk with fragmented resource base</strong></td>
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<td><strong>High transaction cost</strong></td>
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<td><strong>Low No intra integration, but high inter-units integration</strong></td>
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<td>Component of conceptual novel framework</td>
<td>Theoretical description</td>
<td>(ii) Most relevant propositional finding</td>
<td>(iii) Empirical examples from research</td>
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<td>Q2 to Q3 From VIEs to EEs by developing ERP to ERP II</td>
<td>• New strategic partnership has revolved around the operational model by deploying it in integrated enterprise context.</td>
<td>• Shifting from VIE to EE accompanied by developing ERP to ERP II, the new IS systems’ capabilities have been extended to undertake a supply chain.</td>
<td>By re-classifying the value members and re-designing business processes, ZOOMLION’s new production line is based on collaborative alliances with ERP systems. Such information and knowledge enhances the relationships between ZOOMLION and its suppliers, customers, and third parties around the “Virtual Value Net” context.</td>
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<td>Q3 to Q2 From EEs to VIEs by changing ERP II to ERP</td>
<td>• The enterprise with predominately medium asset specific content and information systems needs to adopt ‘lock-in’ tactics to gain industrial dominance and market share.</td>
<td>• After selecting the most valuable suppliers or customers, companies can transfer their EM paradigms from EE to VIE for obtaining more mutual and inter-organizational relationships with both upstream and downstream.</td>
<td>The companies such as ZOOMLION and LANYE, as their industrial-specific, VIE would be more suitable for its business strategy after established stable long-term relationships with forward and backward. As the manufacturing industry would always concern the bargaining power around the marketplace.</td>
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<td>Q2 to Q4 From VIEs to VIEs by developing ERP to ERP III</td>
<td>• Traditional VIE or M&amp;A companies try to seek new innovative venues to sustain their competitive.</td>
<td>• Often happens when the functional roles are ambiguous across the collaborative environment.</td>
<td>After reassigning the value members and re-designing business processes, LANYE has transformed its EM structure from VIE into VE directly by setting up its own “Virtual Private Network” (VPN) and GPS for achieving a site and quick and even actionable manufacturing with the corresponding global marketing demands.</td>
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<td>Q4 to Q2 From VIEs to VIEs by changing ERP III to ERP</td>
<td>• In the case of highly asset specific and complementary competencies can be controlled or influenced by former partners internally.</td>
<td>• As there are many potential risks and challenges inside the VIEs, changing ERP III to ERP in order to reduce the transaction cost.</td>
<td>As soon as completing global virtual network around both mini and inter-enterprise scope, LANYE would gradually change its EM strategy from VE into VIE to gain more market profits and bargaining power to its competition within the same level of industry.</td>
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<th>Static</th>
<th>Dynamic</th>
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- Q2 to Q3 From VIEs to EEs by developing ERP to ERP II
- Q3 to Q2 From EEs to VIEs by changing ERP II to ERP
- Q2 to Q4 From VIEs to VIEs by developing ERP to ERP III
- Q4 to Q2 From VIEs to VIEs by changing ERP III to ERP
In summary, with respect to the above discussion and novel sustainable framework explained by small chunks in Table 8, the dependencies between ERP systems development and distinctive inter-enterprise strategies have been uncovered with explicit descriptions. Nevertheless, the current achievements and findings have only logically induced the dynamic conceptual framework with a set of postulates based on critical literature review and two case studies, rather than prove such framework with proposed transformation and create new formal theories with massive empirical data. In other words, two empirical cases potentially limit the generalizability, validity, and depth of findings. The applicability of the proposed framework would be...
explored by industrial practitioners and other available cases in the further research.

7. Conclusion

The scope of this paper is to propose three generations of ERP systems that focus on corresponding enterprise management patterns and interoperability strategies respectively for the purpose of achieving the agility and flexibility. It has not only investigated how ERP works in a VIE, EE, and VE context, but also uncovers developmental issues to present how one enterprise management type morphs into another using the DERG and the “IS strategy formulating” cycle. The findings imply that the design, operations and management of emergent inter-enterprise structures can be affected by preferable information systems (e.g. ERP). Similarly, different intra-enterprise strategies would compel the managers to development ERP systems to satisfy the IT requirements and newly organizational characteristics. Moreover, the theoretical framework can be applied in any area referring to information systems, strategic enterprise structures, and operation management disciplines.

Besides of the above contributions that can significantly fill in the gaps of extant literature regarding the relations between ERP, inter-operational activities and dynamic intra-enterprise strategies. The results derive from this research also bring some practical implications that may help to guide enterprise managers for making better decisions within the inter-enterprise wide scope. In further, as the exploratory observations and tentative propositions are tended to be validated and developed in the
future, the induced novel sustainable dynamic framework can assist both academia and industrial managers to extend ERP modules and capabilities on the new platform

As a conclusion, the Zoomlion and Lanye case studies with findings via the narrative approach have revealed the future evolutionary trend between ERP systems and inter-firm management strategies within the context of the current global business market. These findings are part of an ongoing work, and this chapter demonstrates that the idea has strong potential contribution to make to both theory and practice.

References


