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Impact of Supply Chain Management on Malaysian Industries

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Abstract

The findings of our Delphi research regarding- the prospective impacts of smart Enterprise Resource Planning (ERP) systems, on Supply Chain Management (SCM) in Malaysian businesses- are presented in this paper. Participants of this research workshop were 23 Malaysian business executives associated with supply chains (SC) in Malaysian firms. The results of our exploratory research were tripartite. First, the respondents of our study described the following as vital SCM concerns for the future: a) supplier-consumer activities integrating further, throughout entire SCs; b) present SC changes requiring a flexible IT sector; c) increased large scale goods and service personalization, resulting in more choice, and at the same time reducing cycle spans and product stocks; d) the entire SC driver's core; e) SCs made up of independent businesses. Also, our findings show that the specialists who took part in our study predominantly felt that smart ERPs had only a limited role in enhancing the effectiveness of Malaysian SCs; and that there was a risk of the ERPs curtailing supply chain management (SCM) progress. Smart ERP was perceived to offer solutions to merely four of the twelve predicted SC problems of the future: 1) increased personalization of goods and services; 2) processes and information becoming more uniform; 3) the requirement of global IT systems; and 4) a more transparent marketplace. Third, the study's exploratory findings reveal that critical restraints for present ERP systems in Malaysia to bolster SCM in businesses here, as being: 1) the lack of cross industrial functions, with narrow boundaries; 2) inflexibility in face of dynamic SC requirements, 3) limited functionality, which does not go beyond transaction management, 4) rigid and hard to scale, systems architecture. Limitations such as these are a consequence of 1st generation ERP products having been shaped to consolidate the different operations of organizations. Today's supply chain management's analysis unit however, has become a meshwork of companies; hence resulting in older ERP products becoming redundant, in today's digitalized business landscape.

KEY WORDS – Smart ERP; Malaysian ERP; Malaysian Supply Chains; Malaysian Delphi Research

1.Introduction

For the past twenty years or so, global enterprises have streamlined internal processes, boosted factory productivity, enhanced goods quality, and brought down manufacturing expenses. Now, they are increasingly drawn toward SC strategies; which could as well prove to be the forthcoming edge in organizational deftness. Among the factors driving these efforts could be: 1) improved logistics processes' potential to generate significant financial gains. 2) the emergence of network economies (Arthur; 1996), triggering deep, penetrative shifts in supply chain management's scope and impacts. In today's digital environment; businesses with total vertical integration are rapidly becoming obsolete, with dynamic organizational networks becoming more of the norm (Fine; 1998). Marketplaces have become increasingly transparent; with the personalization of consumer needs, fast becoming ubiquitous (Jensen; 1999); along with the dynamism of modern business landscapes continuing to explode (Gleick; 1999). All of this profoundly affects the management of not just Malaysian, but global enterprises' SCs as well.

Alongside, another enterprise-driven phenomenon, is making its mark throughout all industries- smart Enterprise Resource Planning or smart ERP. These developments have to be considered from two fronts. From an upper level, decision-making viewpoint, both phenomena are closely associated, but their development in industries is independent of each other. ERP is an encompassing, transaction management system, whose role is to integrate various information processing abilities, and storing them in single databases. Before the ERP became ubiquitous, data were normally spread over numerous information systems or silos. ERP subsumes an organization's divided systems for procurement, order regulation, HR, as well as accounting, with their separate data sources and storages; into one seamless system.

This study's aim was to rekindle academic interest, regarding the interactions betweensmart ERP and SCM in Malaysian businesses; especially in consideration of literature concerning this phenomenon, particularly from a Malaysian point of view, being scarce. This limited literature also necessitated our study being designed with an exploratory phase; to conceptualize theories and themes based on interviews with experts in ERP systems.

To this end, we conducted a Delphi study with 23 respondents consisting of SC executives, in Kuala Lumpur, who are employed by Malaysian firms. Our findings demonstrated the existence of significant links between SCM in Malaysia and smart ERP; implying that the ERP contributes to SCM with regard to elements like standardization, transparency, and globalization. However, not all of these links were found to be positive; with respondents opining that from a strategic viewpoint; present ERP systems in Malaysia could limit SCM's progress- due to their limited flexibility, and single firm scope.

The next section presents our working definitions of SCM followed by a description of ERP with SCM initiatives. The fourth Section illustrates our Delphi study design; the findings of which are depicted in Section 5; and discussed, together with their implications in Section 6. This paper then concludes with Section 7.

2 SCM in the Network Economy

We consider supply chains (SC) as networks which revolve around: supply, manufacturing, distribution, retail, and consumers (Figure 1). At the functional stage, this network braces three varieties of flow; all of them requiring meticulous planning and tight synchronization:

- material flow- this refers to physical goods movements from suppliers to consumers and vice-versa (e.g. goods return, servicing, etc.)
- data flow- this denotes the transmission and tracking of orders; which synchronize physical actions
- economic flow- this has to do with credit, payments, consignments and ownership issues.

Three pillars brace the network:

- processes- these ingrain the organization's strengths in logistics, developing new goods, as well as the overseeing of data
- administrative architecture- these include sweeping inter-connections stretching from vertical integration, organizational networks, management strategies, efficiency measurements and rewards
- empowering technologies- these are made up of process as well as information technologies.

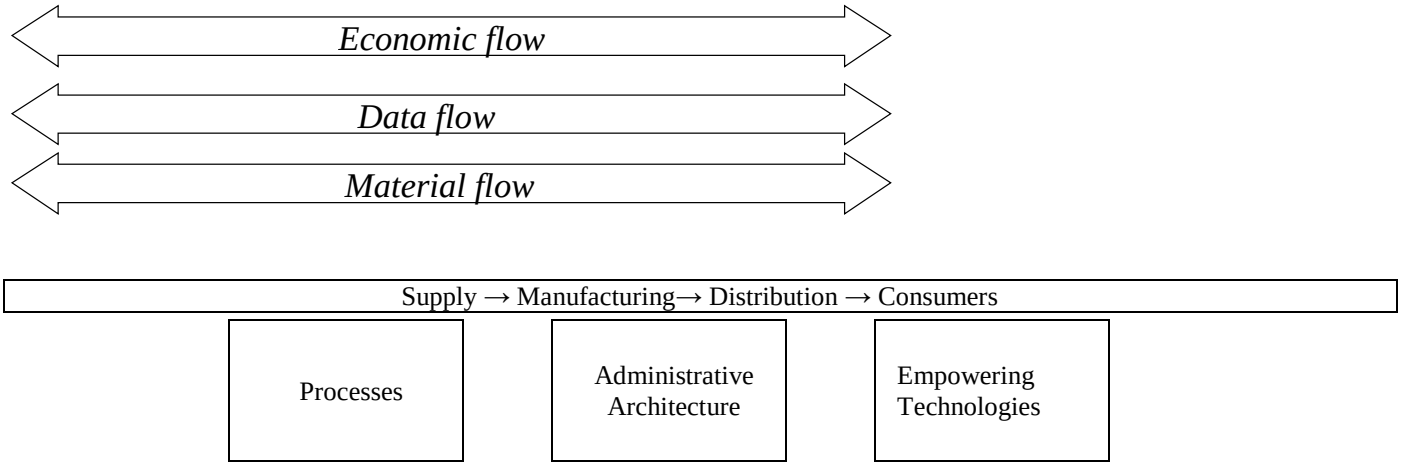

Figure 1 Consolidated SC Framework

The principal roles of SCs (Fisher 1997) revolve around transformation, logistics, and marketplace negotiation (matching demand with supply). The third role of marketplace negotiation is relatively new; with interest in innovative approaches to this phenomenon only beginning to gain traction. These consumer-centric approaches' primary focus is on coordinating the whole chain (Figure 2).

More than merely specifying consumer zones, selecting manufacturers and distributors, or allocating product families to their shelves; SC designs also prioritize on abilities to be grown and retained internally, as well as new alliances with the various organizations throughout supply networks. According to Fine (1998), SC designs should be imagined as dynamic processes which assemble strings of capabilities; not restricted merely to interdependent firms. The 'dynamic' perspective is especially critical in today's fast paced environment where fresh goods and distribution channels require perpetual appraisals of decisions pertaining to SCs. In this paper, the change rate of goods, approaches, technological advancements, and administrative configurations at the core of an industry are referred to, as clock-speed of that particular industry. It goes without saying that product design affects manufacturing performances; and just like that, well designed SCs are invaluable when it comes to overseeing and synchronizing activities related to them.

The dynamic outlook may require different perspectives (or models), to design SCs. The said perspectives being: Administrative, capability, and technological supply chains (Fine 1998).

- Administrative mapping depicts all the segments in a firm's expanded SC; along with value-adding operations associated with all firms across the SC.

- Technological focus meanwhile, maps out dependency lines to suppliers and consumers and is chiefly concerned with the provision and usage of vital technological processes across SCs.
- The Capability domain identifies key business process capabilities, that already exist, and also other desirable ones; throughout the SC.

These type of mappings are harmonious with our opinions regarding the three pillars of SC (Figure 1).

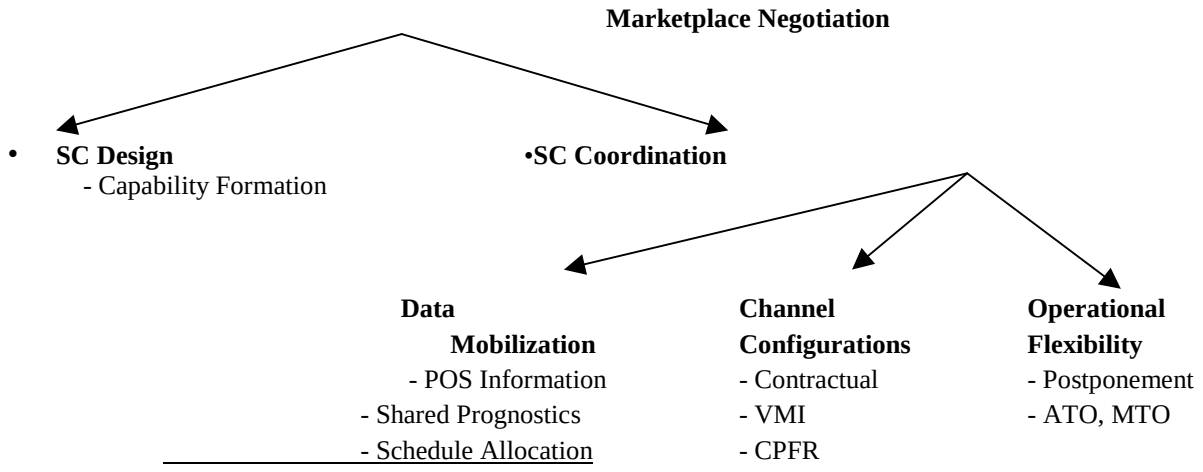

Figure 2 Supply and Demand in a SC

SC coordination, regards three types of flows. Efficient strategies (Figure 2) consolidate a variety of approaches like a) flexible operations (personalization), b) postponement capabilities, c) channel alignments (stock managed by vendors), and d) collaborative decision making processes via shared data (cooperative strategizing, predicting trends, restocking, CPFR, etc.). Alternately, all of this leads to new types of designs within firms (process orientation), and novel types of collaborations between firms (outsourcing through intermediary services providers or contractual manufacturers). The burgeoning ofthis phenomenon has been in parallel with the immense growth of today's ICT systems; hence allowing for tighter collaborations and SC transparency. Today, it is widely accepted that the ongoing breakthroughs in IT, carry the power to rapidly and significantly make efficient; global network operations and consumer services.

In today's business landscape, any competitive advantage comes with a short lifespan; implying that SC solutions too, are short lived (Fine; 1998). Thus, SC management comes with dynamic challenges which requires ever-shifting solutions, to keep pace with the ever-changing industry needs. The afore mentioned clock-speed of an industry determines the validity of its SC solutions.

3 Smart ERP Processes and Systems

Our study pertained to obtaining an overview regarding the impact of smart ERP processes and systems, on SC performances in Malaysian firms; and distinguishing between conditions which make ERPs critical enablers, and conditions which turn ERPs into severe handicaps for successful SC performances. ERP systems can be defined from the business, technical, or functional perspectives.

At a basic level, ERP are integrations of business processes with IT; i.e., a generic expression for consolidated enterprise software programs which spearhead commercial data infrastructures, overseeing a wide variety of range of processes, from obtaining goods, to store floor control and budget management. It is the common denominator which serves as a unifying agent for global management functions, within labyrinthine web and cloud based networks.

Technically, today's ERP systems are logical extensions of Material Requirements Planning (MRP) frameworks which were introduced in the 70's, and Manufacturing Resource Planning (MRP II) frameworks from the 80's. Functionally, they lend support to the management, administration and deployment of resources in single, as well as multi-site firms; with 'resources' referring to anything from materials, to manpower, to financial capital. Modern ERP systems achieve this via three distinct functions:

- Transaction processing engines- These allow for the integration of data management across enterprises
- Work flow management- This function oversees the various process flows which exist in any business, for e.g. order-to-cash processing systems, procurement process systems, etc.
- Decision support- refers to planning assistance (MRP planning runs), or consumer order assistance (Available-to-Promise (ATP) monitoring)

Introducing ERP systems within firms is a highly formidable undertaking; considering the time-frame and the financial implications involved. There is a pressing need for more details regarding the financial implications, implementation obstacles, and management of installed systems. Despite the explosion of ERP ecosystems, little literature is available regarding their impact on Malaysian businesses, once they have been implemented. In view of this scenario, this paper attempts to understand and elucidate the causal links between ERP and SCM.

4 Methods

4.1. Research Design

In light of the literature regarding ERP systems in Malaysian businesses being relatively scarce, we chose an exploratory approach for our study; which allows for the leveraging the vast experience pool brought by ERP experts; who were the respondents of this study. The viewpoints of our expert respondents, together with available literature, helped us develop initial themes and theories. Delphi Studies (DS) are apt designs for exploratory, theory building research; by virtue of their design, which allows for efficient group communication processes, enabling respondents to tackle complex notions (Delbecq et al. 1975). Delphi studies are particularly suited for exploratory-theory development, pertaining to complicated cross-disciplinary matters, commonly associated with various novel or potential future trends (Akkermans et al. 1999).

DS are characterized by sample sizes of least (n=20), to address issues of individual biases influencing aggregate responses. This study satisfied that criteria, with a sample size of (n=23); with the respondents being made up of SC executives from various industries (Table 1), which had ERP and SCM featuring heavily in their organizational strategies.

Another attribute of a DS is, it allows for feedback on previous comments; and also, for further elaborations based on that feedback. Feedback was instantaneous and uninterrupted in our study; due to the utilization of a Group Decision Support System (GDSS)- which let study participants read other's entries, comment on them, or further elaborate their own initial views- with anonymity being maintained throughout the entire process.

Table 1 Industry backgrounds of respondents

Sector	Participants
Automobile	2
Chemical	5
Household electronics	2
Food & beverage	2
Logistics services	7
Petrochemical	1
Semiconductor	2
Telecommunication	2
Grand Total	**23**

The analytical objectives of this study were:

- Identifying major SCM trends in Malaysia
- Assessing the business impact of these trends
- Assessing ERP support in Malaysian firms, with regard to these trends
- Identifying key obstacles for current ERP systems to effectively support SCM in Malaysian firms

To garner results, the 8-step workshop process was utilized (Figure 3). The varying quantity of items which arose from each tier; are indicated in the horizontal bars.

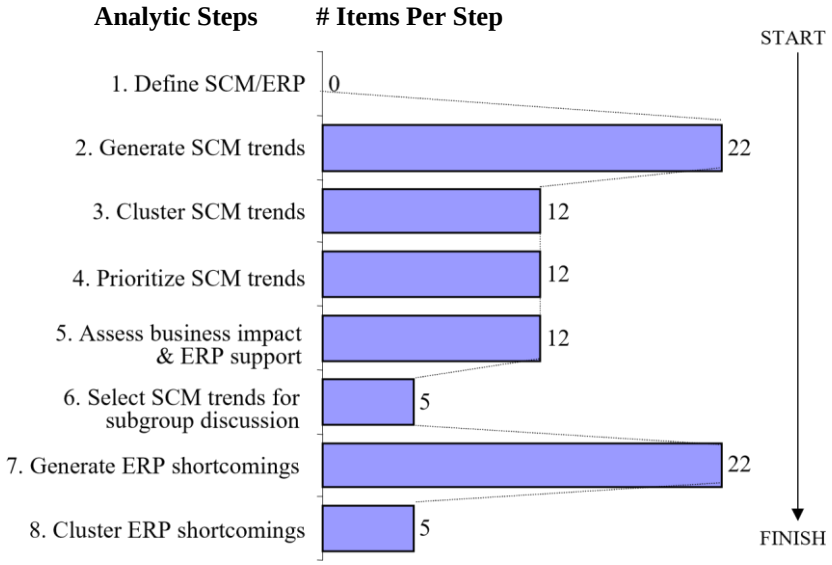

Figure 3 Eight-step workshop process

4.1 SCM and ERP Definition

To prevent confounding terminology, respondents were briefed by the researcher regarding these definitions within the context of the research. The gist of which can be found in sections 2 and 3 of this paper.

4.2 Generating SCM Trends

Here, respondents were told to input, what in their opinions: were 2 – 3 leading SCM trends in Malaysia currently. Similar to the Nominal Group Technique (NGT), we conducted this process on a personal and incognito fashion, to ensure the variety of topics inputted, and also to obviate groupthink biases (McGrath 1984). However, unlike the NGT, our study alerted respondents of items already inputted; thus having the edge of being able to eliminate duplicate inputs. This generated 22 leading Malaysian SCM trends in total.

4.3 Group SCM Trends

There was further clustering in this stage; whereby participant responses were assessed individually to discern if they could be matched with each other. Items were sorted together wherever possible, with all original data being retained. This process generated another set, consisting of twelve vital trends, concerning SCM in Malaysia.

4.4 Ranking the SCM Trends

A straw poll was conducted to rank the finalized 'trends list', with respondents picking 3 trends SCM each, which they perceived to be most vital in the Malaysian context. The resultant ranked list consisted of 12 items (Table 2).

4.5 Business Impact of SCM Trends and ERP Support

In this step, respondents were requested to rank what they perceived to be the top-12 SCM trends in Malaysia, in relation to: 1) Each trend's anticipated business impact; 2) the extent of support/ hindrance that ERP would offer these trends.

The resultant assessments were collated with the overall scores being presented via a scatter plot (Figure 4).

4.6 SCM Trends- Subgroups

Five out of the top 12 trends were then shortlisted; to be discussed more in detail, with five respondent subgroups who had voluntarily enlisted for this step. The selected fads being: Integration; Customization; Drivers; Information exchange; and Transparency (Table 2).

4.7 ERP Limitations

The respondents in the five subgroups, consisting of four to five experts; were posed questions pertaining to the topic they picked; with the cardinal focus of our study being on: The limitations of current ERP systems used by Malaysian businesses in supporting SCM trends in Malaysia. Discussions with respondents were conducted both orally as well as through the GDSS; and the session concluded with a plenary discussion of the findings.

4.8 Cluster ERP Limitations

In this step, redundancies found in the ERP limitations list were removed; leaving 22 different items; which were then aggregated into five different clusters (Table 3).

5 Findings

The main empirical findings of our study are described in this section. Section 5.1 discusses the most vital future SCM trends in Malaysia; as perceived by the expert respondents. Section 5.2 regards the benefits of current smart ERP systems, to these shortlisted SCM trends; and finally, Section 5.3 describes negative characteristics of current smart ERPs, in relation to SCM in Malaysia.

5.1 Key Future SCM trends in Malaysia

The initial stage of this exploratory workshop concerned: creating a hierarchical check- list of vital SCM trends or difficulties, that would be encountered in future by Malaysian businesses; corresponding to steps 1-4 (Table 2). It could be said that the most remarkable finding of this study is that, the results were not remarkable at all. In other words, top ranked items suggested by our respondents made up of Malaysian SCM professionals, corresponded with our description, based on the literature, of the same. Next, a brief discussion of each key trend; based on the 'clock-speed' perspective will be presented.

Table 2 Key Future SCM Trends in Malaysia

Key issues in SCM	% Votes
1. Suppliers and consumers integrating further, throughout entire chains	87%
2. Flexible ERP systems to address dynamic SC requirements	57%
3. Mass personalization: convoluted heterogeneity, diminished cycle times, and stocks	39%
4. Determining suitable drivers for SC co-ordination	35%
5. SCs made up of more than one enterprise	35%
6. All stakeholders able to access all information in the chain	35%
7. Increased outsourcing of distribution, financial and administrative processes	30%
8. Improved IT-tools required for integrating various parties in the SC	30%
9. Globalization of ERP designs and systems	26%
10. Enhanced transparency of worldwide marketplaces	26%
11. The cloud will be the unifying factor; bringing together chains' systems of partners	26%
12. Homogenization of processes, data, and IT infrastructures	22%

Respondents were almost unanimous in stating that, marked increases in integration between suppliers and consumers throughout the whole chain; would be among the most significant future trend in Malaysian SCM (87% votes). This resonates with the third ranked trend i.e., increased large-scale personalization; with both possibly sharing comparable root causes, i.e., heightened gain striving, fueled by increasing consumer clout; in increasingly transparent market-place landscapes. Constantly growing consumer needs like hyper-personalization result in operational challenges like convoluted heterogeneity, with shorter cycle times. Additionally, the highly dynamic nature of consumer needs today, require for little inventory to be stocked in SCs; and also necessitate sweeping modifications in SC frameworks. Thus, maintaining adequate flexibility in a setting of constantly changing SC needs becomes a conundrum for current ERP systems in Malaysia,

Respondents anticipated single organizations facing a lot of challenges; to fulfill the dynamic needs of today's customers; suggesting instead, that several enterprises would make up SCs. Adding that non-core processes like physical distributions and F&As will progressively be outsourced.

The experts also stated that since traditional power hierarchies will soon cease to apply in future business infrastructures of networked autonomous organizations; the question of who heads, or drives these SCs would inevitably crop up. What could have unsettled our respondents with regard to this question maybe: Fine's (1998) 'clock-speed' notion maintains that SC managers may no longer have any power to determine the one in the driver's seat. This is because power would be held by the entity within the organization, who is fastest to leverage incoming breakthrough technology.

Our practitioner forum differed from Fine's (1998) model with regard to the data exchange along with IT focus which arises from the ranked list's bottom half (Table 2); which can be attributed in part, to our workshop's general theme i.e., IT's impact on SCM among Malaysian businesses.

Larger and more dynamic consumer demands would necessitate swifter, all-encompassing exchanges of information amongst stakeholders positioned throughout SCs. Technology-wise, this does not merely refer to enhanced ERP systems, but, also improved IT tools to consolidate the different elements in SCs. This would allow for distributed architectures, where homogenization occurs predominantly at information definitions and processes layers; thus flexible, local data utilization could be sustained to an extent. All of these advances are occurring on worldwide scales; and hence, IT pertaining to SCM generally, and smart ERP designs specifically, would need to be devised while keeping this fact in mind.

5.2 ERPs Anticipated Impacts on Malaysian SCM Trends

Our workshop's 5th step was conducted using a basic type of 'multi-criteria analyses'. The output is depicted bi-dimensionally in (Figure 4); as the accumulated tallies of all the main Malaysian SCM trends, the anticipated impacts of the highlighted trends, along with the extent of Malaysian smart ERP's support or hindrance of these trends.

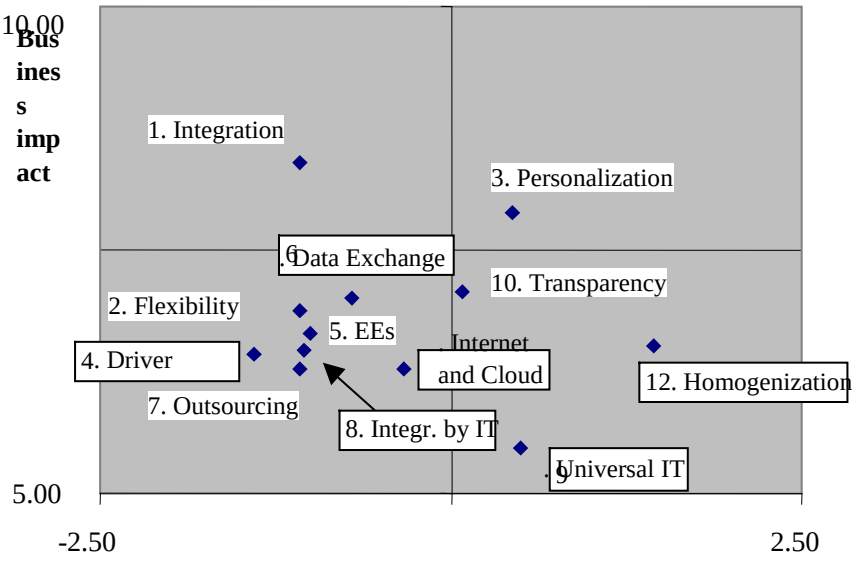

Figure 4 The Impacts of Smart ERP on SCM Activities in Malaysia

The feedback which stands out in the scatter plot is: generally, the respondents of our study were not too convinced about currently available ERP systems enhancing future Malaysian SCM developments. Of the key trends, only three were seen as benefiting from smart ERPs in Malaysia; with the remaining, as being impeded by these ERP processes. In general, ERPs were perceived to impede business trends which were linked to strategy; for e.g. 'integration', 'driver', 'outsourcing', 'extended businesses'. Nonetheless, smart ERP is perceived as being beneficial regarding more technical matters like the homogenization or standardization of processes; as well as universal IT systems.

Two evident irregularities are there with regard to the inference that the strategic SCM- smart ERP connections are negative, with technical SCM – smart ERP links being positive, in Malaysia. The former pertains to the requirement of possessing the necessary IT tools to consolidate the SCs of multiple stakeholders; and the latter pertains to the strategic issues associated with large-scale hyper-personalization. Though the respondents of this study referred to user interfaces with end consumers;smart ERP systems' capability to amalgamate consumer-specific orders into productions, are among its strategic assets.

5.3 Smart ERPs Limitations in Contemporary Malaysian SCM

The concluding three steps of our workshop served to examine the reason for current ERP systems to be perceived as unhelpful; for a large portion of the major, future SCM trends in Malaysia. We focused on ERP systems shortcomings instead of their advantages; as understanding shortcomings offer solutions for enhanced IT support for Malaysian SCM. Currently, the Malaysian ERP industry which consists of software, middleware, and hardware vendors; SC experts, as well as specialty-software houses, is a tight knit ecosystem which is evolving rapidly, to stay relevant and provide effective SC solutions. Consequently, it is vital to figure out contemporary technology's contributions to SCs and highlight the favorable attributes of future versions.

The respondents of this study identified desirable attributes of future ERP systems, which were extensions of negatively formulated, present ERP systems' shortcomings (Table 3). More often than not, similar ERP shortcomings for different SCM trends popped up, during multiple subgroup discussions. This would explain "extended enterprise functionality" being listed twice. The clear clusters which were generated from the subgroup discussions are:

1. All Encompassing Business Processes- The lack of which, was the initial as well as most conspicuous common thread to emerge from subgroup discussions. Present ERP systems in Malaysia, manage product flows within single, centralized businesses; but the markets are shifting toward inter-organizational SCs. The respondents felt that it is cumbersome to inter-connect present Malaysian ERP systems with other systems; which would in turn lead to lagging information exchange.
2. Flexibility to Adapt to Malaysian Businesses' Dynamic SC Requirements- or the lack of which, is the second shortcoming of contemporary ERP systems in Malaysia. Quoting one respondent who is a logistics manager: "All our efforts in continuous improvement on the production floor have first been frozen for a year and a half by our ERP package implementation. Now we are still struggling to get it operating properly. And from then on, any change that is to be supported by our IT system will have long delays and high costs because of the difficulties in making changes to the system." This resonates with Upton and McAfee's (1997), assertion concerning the disparity between sustained improvement processes and the "big bang" methodology intrinsic to present ERPs in Malaysia. As consumer needs become more dynamic, business processes and SC infrastructures need to assimilate as quickly; with ERP systems not encumbering process innovation but supporting it.

Table 3: ERP Systems' Shortcomings in Malaysian SCM: Group Discussion of Specific Themes

	Themes from discussion groups:
1. Lacking Comprehensive Business Processes to Support Operations Across Diverse Firms	
• All Encompassing Business functionality	1. (Integration) 4. (Driver)
• ERP systems do not link across business borders	7. (Transparency)
• ERP systems only interconnect efficiently with partner systems	7. (Transparency)
• Underdeveloped information exchanges between stakeholders	1. (Integration)
nable to brace multiple coding systems; hence does not allow for cross-organizational implementations	1. (Integration)
2. Lacking flexibility to adapt to dynamic SC Requirements	
• Flexibility in adapting to dynamic business models	3.(Personalization)
• Flexibility in adapting to dynamic business processes	7. (Transparency)
3. Lacking advanced support functions other than operations management	
• Data exchanges are flow based as opposed to order based	1. (Integration)
Based on MRP, and not on infinite capacity; ERP+ required	1. (Integration)
• Advanced planning systems having confirmed functionalities	3.(Personalization)
• Connected to strategic decisions	4. (Driver)
• Switching of decision support from operations to data	4. (Driver)
4. Lacking transparent, scalable, highly interconnected systems architectures	4. (Driver)
• Scalable systems	
• Module managers for SCs	4. (Driver)
• Interconnectivity	3.(Personalization)
• Cloud Powered ERP	6. (Data exchange)
5. Miscellaneous	
• IT (cloud technology, enormous, shared databases, etc.)	6. (Data exchange)
• Personalization is part and parcel of the new digital economy	1. (Integration)
• creating business cases to overcome Identified obstacles	6. (Data exchange)

5.4 More Than Just Transactions: Advanced Support Functionalities

Majority of the respondents perceived the implementation of ERP systems as merely being an introduction of transaction management systems. By itself, this was a requisite infrastructural investment in the past; serving to do away with IT fragmentations. The system made SCs completely transparent, allowing salespersons to respond to consumer queries in real time. It is capable as well, of discerning ideal ways to deliver products to the consumers, invoice them, and credit salespersons. Available to Promise is a notion within ERP spheres; and is an exemplification of the system's functions shifting beyond solely transaction management; to more strategic decision-support functions. This type of functions, lacking in current Malaysian ERP systems; stood out in various subgroup discussions; as being one of the shortcomings of present ERP systems used by Malaysian businesses.

5.5 Accessible, Scalable, Inter-Connected Systems Architectures

Today's ERP packages are integrated; allowing them to oversee a majority of operations in various functional departments e.g., procurement, production, marketing, logistics, etc. In this manner, they offer much improvement when compared to the fragmented local legacy systems which they have displaced (Davenport 1998). Respondents of this study believe that challenges faced by ERP systems used here; is shifting to more modular, cloud like architectures; hence enhancing information exchange among all the stakeholders, throughout the chain. This would result in power structures in extended SCs becoming more independent of ERP systems of the biggest stakeholders in any particular chain. This would also boost communications with consumers through enhanced customer systems, and hyper-personalization.

6. Discussion

This section describes the findings of our Delphi workshop; whereby we focused on the expert respondents' feedback consisting of: a) List of Malaysian SCM trends, ordered by rank; b) Impact of present ERP processes and systems on highlighted SCM trends in Malaysia; c) ERP's limitations in backing the diverse SCM trends seen in Malaysia.

With regard to the first finding, respondents in our study recognized SCM trends in Malaysia which were alike those that were described in the literature. However, there is scarce literature with regard to the latter inferences, i.e. research which ties ERP with SCM from the Malaysian context. Hence, we focus our discussion on these two findings.

6.1 ERP Support Options for SCM in Malaysia

Respondents of our study indicated several vital SCM trends in Malaysia, for which they concurred that present ERP systems offer evident support. These were in regard to business impacts; and in descending order, they are: 1) Large-Scale Personalization (LSP), 2) Homogenization or standardization, 3) Universal IT/ERP processes and systems.

6.1.1 Large-scale personalization (LSP)

LSP, i.e., designing products to fulfill the precise requirements of individual consumers (Pine 1993), revolves around supplying a sweeping range of personalized consumer products and services; swiftly, effectively and cheaply. It therefore, incorporates large scale production (like Ford Model T) with craft production (like personalized clothes). ERP is capable of supporting LSP, providing consumers are able to configure their products, as combinations of a series of predefined choices. Traditionally, "configurators" (specific algorithms) in ERP ecosystems supported this facet of LSP by translating individual consumer demands into viable product specifications.

These types of functionalities are generally seen in small-capacity, high-technology settings. It has not yet been convincingly ascertained if ERP would be capable of, or if there is even a need for it- to handle today's immense quantities of unique consumer orders (hence, production orders)- in Malaysian SCMs with high volume environments. For commodities, the personalization component does not come from the goods in themselves; but more from services linked to this component; e.g. personalized consumer profiles, personal deliveries, etc.

As with most types of functionalities, optimum solutions operating above ERP are out there; with their sophistication levels ranging from low-key (clicking on required options) to Hi-Tech (Cloud Technology, AI, and rule-based expert systems supporting consumers in defining ideal product configurations, which fulfil the relevant functional requirements, whilst ensuring completeness and consistency).

6.1.2 Standardization

In this paper, standardization is looked at from two varying perspectives: the internal business and the SC perspectives. Regarding the former, organization-wide ERP systems do significantly affect standardizations of both, processes as well as information.

ERP brings about the standardization of processes by its utilization of best-practice templates. In today's cloud enhanced digital landscape, suppliers and consumers, have grown to expect consistency in all contact points of any enterprise, irrespective of type or geographic location. To this end, ERP facilitates consistent actions amongst each SC stakeholder by allowing for homogenized operations and, access to consolidated information sources. Also, by data and processes standardizations, ERP technically allows businesses to garner consistent performance measurements of their own enterprise; and also to monitor their partners' showing.

From the SC angle, a number of ERP vendors have set actual standards in some industries (e.g. Baan in Aerospace); which facilitate the standardization of business processes and information frameworks throughout whole sectors; all the more so, since ERP implementations in Malaysia usually depend on best-approach-operations designs. This type of converging process template, results in homogenous data flows, as well as homogenous systems architectures within a business entity; facilitating the constant reconfigurations of SCs required bythat business entity.

6.1.3 Universal IT

In order to globalize, businesses need far-reaching ERP implementations; whereby the chief concerns are not so much technological; as today's IT landscape permits ERP systems access from any corner of the globe. Also, as more and more ERP system processes are becoming cloud based, technical limitations reduce even more. Unlike traditional legacy systems, ERP systems come with considerable advantages, with regard to: technical infrastructure (client/server electronic communication), functionality (transcending language, monetary, and time-zone barriers). The actual concerns regarding 'global IT' are predominantly organizational, i.e., organizational strategies have to be drawn up before the deployment of technology. Some of the strategies revolve around:

- The extent of needs or wants of a global firm for homogenized processes; as well as distinguishing between regional and international operations
- Standardization of systems and user-interfaces; with the first enforcing comparable- processes on worldwide proportions; and the second allowing for 'within-regional' processes, by seeing to it that standard communication channels amongst the various parts of the organization constantly remain open. When it comes to the networked economy, the latter is more ideal, because it supports dynamic SC designs; whereby firms' architectures as "networks of cooperating business units" will constantly evolve, as there will be high turnovers of enterprise units entering and exiting the system. This is contrary to monolithic, global ERP systems, which severely constrains this agility for evolution.

• Issues related to time, and global roll outs of ERP systems (which if drawn out) would stymie implementations of truly global, homogenized systems.

6.2 Current ERP Systems Shortcomings in Malaysian SCM

The respondents of our study emphasized on four shortcomings of present ERP systems utilized in Malaysia, with regard to: (1) Expanded organizational functionalities, (2) flexible adaptations to industrial changes, (3) advanced decision support and (4) lacking (cloud-based) scalability. We hold that the latter shortcoming is a leading cause for the first three. Cloud enabled modules could even allow for the 'borrowing' of particular functionality from one's business partners; which is not seen in current ERP utilized in Malaysia; due to its highly integrated nature preventing such types of flexibility

There also exist alternatives to currently used ERP systems in Malaysia; which are products of the thriving business of SCM aligned auxiliary software. These firms develop programs, for general functions like Advanced Planning and Scheduling, and also particular business operations such as, "demand planning," "customer order management," "warehouse management", etc. Such, elaborate, intricate environments, consist of sophisticated applications, which are capable of effortlessly assimilating with one another, courtesy of cloud technology and dedicated connectivity tools.

6.2.1. Lacking EE Functionality

EE functionality is seen as the capability of efficiently sharing internal data with SC partners and accommodating data made available by them. Sharing of these data is advantageous for operational decision-making or measuring SC performances. Also, the EE functionality is an enabler for business processes which are dispersed over numerous business entities. For e.g. classical order capturing processes would entail: distributed ATP checks, credit checks via financial service providers, and logistics service providers for deliveries.

Current ERP systems utilized in Malaysia are lagging when it comes to EE functionality; based on their design, whereby only the integrated management of internal resources is focused on. It is possible to upgrade these systems with connectivity software, process ware (specific connectivity software which provide pure data exchange services, and also services concerning particular enterprise process flows), tools specific for data warehousing, SC implementation systems, etc., in order to overcome this shortcoming.

6.2.2 Inflexibility Concerning Dynamic SC Requirements

When it comes to the notion of flexibility, different levels extending from the solely operational, to more strategic, ought to be distinguished. In Section 2, SC designs versus SC coordination, from a Malaysian perspective, were discussed. IT systems should be adequately flexible in dynamic environments, made up of wide and varied consumer needs. ERP systems currently utilized in Malaysia are capable of supporting these forms of coordination.

However, the respondents emphasized that flexibility issues with ERP systems, are more pronounced in SC designs; i.e. perhaps due to solitary firms possible having varying links with suppliers and consumer bases. As an extension of this, their ERP systems ought to be flexible enough, to handle multiple relationships. Vendor Managed Inventory, together with Collaborative Planning, Forecasting and Replenishment; are the more sought after collaboration strategies, used by Malaysian firms.

Efficient ERP systems should come with the ability to simultaneously accommodate all these varying collaborations, and switch seamlessly between modes; which is in line with the Gartner Institute's assertion that the capability of seamlessly engaging and disengaging from — collaborative association is of paramount importance. More complex situations arise when the key players in the SC keep shifting with changing consumer orders, i.e., when the SC becomes more and more responsive to market sentiments (Fisher 1997).

An alternate form of flexibility, which is less SCM-specific could prove to be as important is- the redesigning of business processes. As mentioned earlier, SC designs are facilitated by an assortment of enabling IT, as well as novel and/or redesigned processes. On one hand, SC performances of an organization cannot be enhanced by IT, unless the organization's processes and organizational architecture undergoes redesigning. Conversely, the re-engineering of processes to enhance SC performances is heavily dependent on IT; and combining this with business process re-engineering throughout the SC, is the next logical step.

However, to control for expenditure, complications, and timeframes for ERP execution, quite a number of Malaysian firms have chosen to embrace process re-engineering. This strategy is overseen by functionalities ingrained in the ERP systems chosen. This type of strategy commonly involves the utilization of business process templates which mirror the best approaches to a particular industry. It would be sufficient if these best practices translate into improvements over recent business practices; but if the processes which are undergoing standardization represent inimitable sources of competitive advantages, the introduction of ERP systems could elevate the chances of relinquishing those edges.

By themselves, re-engineering undertakings may give rise to long-term disadvantages; because these initiatives, usually undertaken with strategic leaps in mind; involve major funding and substantial outside expertise. Lower-level workers would be affected by their organization's strategic decisions, as these group of individuals tend to be the end operators of processes, technologies or equipment that are newly rolled out. Nevertheless, they do not normally play any role in decision making, or the

implementation; which come under the scope of experts. Put another way, lower ranked employees are instructed on how to utilize latest technology, however their organizations' leadership does not consider their inputs in the course of the decision making and execution stages.

Ongoing improvements require significant involvement of the lower and middle levels of business entities; being reliant on the workers' deep, evolving knowledge of operations. It can be clearly seen that the two approaches need to be balanced to effectuate successful ERP implementations Malaysia.

6.2.3 Lacking Advanced Decision Support (ADS) Abilities

SCs more than individual firms, compete in an environment which is suffused by heightened exigencies for decision support software to come with common designs. Previously, ADS was solely focused on by specific Advanced Planning and Scheduling systems (APS) vendors, but today, ERP vendors too are getting involved in this. The prevalent opinion is; as of now, they significantly lag in functionality, but are rather impressive with regard to integration. APS vendors leverage their advantageous position by penetrating collaborative distributed planning domains, where else ERP vendors continue to focus on internal SCs.

At present, the following functionalities are commonly highlighted:
1) Present Malaysian ERP systems are capable of conducting ATP inspections by auditing inventory (or MPS) and offering responses such as "Yes, I can accept your order because I have inventory available, or it fits within my MPS."
2) APS systems which are capable of accessing business data in real-time, would be able to conduct 'capable to promise' (CTP) inspections and offer responses like: "Yes, I can accept your order, because I have spare capacity that I can use to produce your order." Supplementary functionalities would allow for the checking of the technical feasibility as well as profitability of the order and give responses like: "Yes, I will accept your order because I have capacity available, and it is profitable (enough) for me to allocate this capacity to meet your requirements."
3) Greater sophistication levels would be attained if CTP inspections are conducted in Engineers-to-Order environments; where responses such as, "Yes, I can design a new product for you, and yes, it is profitable for me to do so", would be obtained.

When the capabilities of other SC stakeholders are included, sophistication levels will rise up a notch; and rephrasing the three responses above, potential responses would transform into:
1) "Yes, I can accept your order, because throughout the supply chain, products and materials are available."
2) "Yes, I can accept your order because I have spare capacity, my suppliers have capacity to produce sub-assemblies, my logistic service provider is able to deliver the product at the moment you need it, and the overall landed cost does make this order commercially attractive."
3) "Yes, I can accept your order because I -as well as my supply chain partners- have development capacity available."

At even higher sophistication levels, one may be able to respond to consumer orders with:
1) "Yes, I can accept your order; I will design a new supply chain specifically for you."

The cutting edge ERP/APS solutions can offer real-time assistance for conducting local ATP/CTP inspections as indicated before this. Cross-business cooperative technologies are relatively new in the marketplace. Value Chain Initiatives or Smart E-Business Initiatives define infrastructures that rely heavily on Internet and Cloud technology, which allow for actual time interactions amongst ERP processes and systems, logistics and warehouse management programs, APS systems, etc.

6.2.4. Lacking Open, Scalable Systems Infrastructure

The fourth shortcoming shortlisted by our respondents was: present ERP systems utilized in Malaysia do not have adequate scalable, open, cloud powered interconnected systems infrastructures, or "cloud powered ERP" as one of the respondent subgroups labeled it. At its core, this particular deficiency is the opposite of a couple generic ERP advantages described in Section 3, where we stated that ERP systems were initially meant to supersede bulky local legacy systems; hence much emphasis being put, on its integrated infrastructure. In today's digital landscape, this earlier strong point has swiftly transformed into its weakness.

7 Conclusion

The constantly advancing digital business environment today has brought about drastic changes in existing global business frameworks; particularly in SCM. Today the yardsticks for successful businesses are no longer individual companies, but entire chains of delivering and supplying firms; with individual companies being merely single units of the whole. This phenomenon considerably elevates the relevance of SCM, when it comes to corporate longevity. Our study has reaffirmed this notion, based on the feedback regarding key SCM trends in Malaysia, as opined by our panel of 23 SCM executives based in Malaysia.

Our study concerning present ERP systems' impact on the shortlisted, key SCM trends in Malaysia were exploratory in nature. The overall conclusion arrived at by our Delphi study was; the benefits of present ERP processes and systems for SCM in expanded Malaysian business entities, are insignificant; although ERP systems today, are absolute standards for businesses. They have replaced cumbersome, bulky, local legacy systems; and process-oriented, core business operations within ERP systems are capable of propping up developments in various enterprise domains, including SCM- within individual organizations. However, ERP systems are not designed merely to brace SCM, nor across numerous businesses. These systems' structural edge of

completely consolidating one company turns into a strategic drawback in today's digital business landscape; wherein the requirements are for scalable, transparent as well as flexible IT solutions. It remains to be seen, if new viable solutions will take precedence over, work alongside, or replace today's ERP systems. Also, it is not certain as to who will own these solutions; whether present ERP systems vendors or otherwise. Further in-depth examinations of these aspects are needed, to fill the present gaps in the literature with regard to the impacts of current ERP systems utilized by Malaysian businesses.

The incredible technological advancements experienced today, which have resulted in rapid developments of increasingly transparent, scalable as well as malleable IT solutions; offers much encouragement for SCM systems worldwide. The arrival of powerful cloud powered systems, booming computational and communication capabilities, incredible amounts of accessible data, together with vastly improved industry-specific standards will soon interface individual ERP implementations. These technologies would play significant roles in setting up 'plug and play' architectures; whereby specific solutions can effortlessly be paired with specific challenges in the ERP environment. The resultant seamless SC would be the culmination of tangible benefits; of substantial global IT investments over the past three decades or so.

Although SC transparency is relatively easy to attain with progressive ICT architecture, SC collaborations remain a poorly understood concept. More research in SC-wide efficiency evaluations and incentive designs are needed; particularly from a Malaysian standpoint- so as to furnish a solid academic foundation to augment the technological advancements seen today.

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