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# The Role of Third-Party Logistics Providers in Mass Customization

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Mass customization is coming to the forefront of international supply chains, contributing to an increasing focus on postponement. Third-party logistics providers, are targeting postponement applications as an extension of their service portfolios. Findings from a multi-annual survey (1996-1999) are presented to generate insights into the supply chain mechanisms service providers can use to develop postponement services. A framework for achieving extension of their activities is then developed.

Mass customization is argued to be a new competitive paradigm [1] and agility in the supply chain is a prominent goal. Numerous authors have stressed the importance of interactively marketing and manufacturing products [2] and customizing products in response to individual customer orders, while retaining cost effectiveness in operations [3]. For mass customization of products the supply chain has to be organized in a manner that enables customer responsive and cost competitive operations [4]. Bundles of supplementary services such as customer-specific product configuration, the adding of product features or specific packages and product displays are often used to customize product/service offerings [5]. Postponing product finalization is a prime means for achieving customization, aligning the offer to individual customer requirements [6].

Logistics can play an important role in achieving mass customization [7]. In fact, most often manufacturing is postponed in the distribution channel, in order to be close to the customer and allow for rapid delivery of customized products. This implies that materials management and manufacturing activities are positioned further down the distribution channel. Daugherty, et al. [8], state that a number of activities can be placed in the distribution channel in order to contribute to the offering of customized services at competitive cost levels to the end customer in the supply chain. In the distribution channel, displays can be

assembled, customized delivery services can be offered, and products can be assembled to order (postponed manufacturing). The application of postponement operations has been increasing [9]. Morehouse and Bowersox predict that by the year 2010 no less than half of all stock, at least in food supply chains, will be stored until final customer specifications have been received and goods can be finalized and packed for shipment [10].

With customizing activities placed in the distribution channel, it is not surprising that Third-Party Logistics providers (TPLs), see this as a viable extension of their service offerings. By offering these services, TPLs can penetrate segments of the supply chain with higher value-added operations, such as final manufacturing, rather than the commonly offered transport and warehousing services. These traditional services are rapidly becoming a commodity with low involvement from clients, low margins and stability of relations. Offering customization and postponement services, supplementary to existing services, can give TPLs a differentiation edge. By raising added value for customers, TPLs can improve margins, as well as customer relations. The argument is that by expanding the scope of services offered TPLs can deepen the relation with customers, possibly even giving the TPL a value-added solutions provider position. Research among manufacturers [11] however, indicated that typically postponed

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manufacturing activities such as final assembly and packaging of products are outsourced to third parties by only a few companies and to a lesser extent than traditional services such as warehousing. The focus of this paper is the operational mechanism that third parties can use to offer expanded services in the sphere of postponement and mass customization.

### **Upgrading Third-Party Logistics Services in the Supply Chain**

It should be stressed that TPLs are targeting a different position in the supply chain with supplementary services. Supplementary services are not limited to manufacturing-related services as they can also be information related.

Even though little research has been conducted in this area, it seems that there is an emerging flow of papers on TPL service offerings and customer relations. Cooper, et al. [12], stated that one of the roles of third parties in supply chain management is to facilitate the application of postponement. Thomchick, et al. [13], studied the evolution of third-party logistics service offerings and found a significant increase in the number of services offered. Williams and Lewis [14] found that in general, performance measurement may contribute to the offering of supplementary services. This research on TPL service offerings was developed with the intention of generating further initial insights through an annual survey of TPLs. The first survey in 1995 was a survey of 782 international companies in TPL, manufacturing and wholesale sectors that focussed on the application of postponement in general and by TPLs in particular. The aim was to reveal the status quo in the market for TPL supplementary services. It was found that postponement activities are practiced at far higher levels in manufacturing and wholesale sectors, as opposed to the TPL sector. TPLs are involved in relatively simple customizing activities such as packaging, but far less in final assembly and related activities. Based upon that finding, follow-up surveys were conducted between 1996 and 1999 and aimed at identifying practices and supply chain mechanisms TPLs might use in order to start achieving service expansion. These

annual surveys were directed at TPLs and conducted as telephone surveys.

In the following sections, findings from these surveys will be presented with the intention of revealing the status in the expanded service practice of TPLs. Are they already offering these services, at what level and with what progress throughout the last years? Second, the possible supply chain mechanisms TPLs can use to support an expanded service strategy will be assessed. This forms the basis for a framework that can support the realization of expanded service strategies by TPLs.

### **Findings**

Table 1 shows the extent to which respondents offered the supplementary customizing services included in the survey in 1998, and the level at which they expected to offer them in three years time. Respondents were asked to indicate the extent to which they offered various services on a six point Likert scale, ranging from "offer to none of our customers" to "offer to all our customers". Services ranged from final manufacturing to adding product features and more simple applications of postponement such as packaging. The items included all applications of postponement mentioned in the previous sections. Additionally, some supplementary services were included. Bonded warehousing, the storage of goods in a bonded environment for example, is frequently offered as an extension of traditional warehousing services. To prepare and print bills to final customers is also often offered in addition to shipment to final customers. Call center customer services include informing the customer about deliveries and customer ordering services by phone. With the growing popularity of direct marketing, related to the emergence of interactive marketing, third parties have begun to offer these services, trying to take over a larger share of the coordination of the service activities and to penetrate fields of activity related to traditional fulfillment activities.

Table 1 shows the average levels at which supplementary services are offered by TPLs. The first column shows 1998 levels, the second column shows the average level at which the services were offered a year later,

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	1998	1999	Three years from now	Significant difference?
Packaging activities	0.58	0.48	0.71	<0.05
Final assembly	0.14	0.27	0.39	<0.05
Product configuration	0.30	0.35	0.49	
Reconditioning of products	0.21	0.36	0.46	
Advice about logistics strategy at the tendering stage	1.42	1.05	1.29	<0.01
Advice about logistics strategy as a separate service		0.67	0.92	
Financing inventories		0.20	0.28	
Billing the final customer	1.08	1.08	1.14	
Testing/repair of products	0.31	0.28	0.37	<0.05
Installation of products at final customer's site	0.12	0.41	0.46	
Building of displays with products	0.14	0.18	0.24	
Receiving and inspecting return shipments	0.73	1.02	1.06	
Sizing products	0.18	0.24	0.31	
Adding product features	0.18	0.39	0.43	
Inventory management and registration	1.36	1.08	1.34	
Total average score on items:	6.65	7.78	9.63	<0.1
Key: Average scores on a 6 point scale ranging from 0 (do not offer these services) to 5 (offer this service to every customer). Independent t-test using data from the 1999 survey.				

the third column shows the level at which the respondents expect to offer these services in three years time. The final column shows the results from a t-test of differences in levels between the last two columns.

The overall impression is that services are offered at a rather low level and consistently so throughout the years. These findings are in line with the findings from the survey mentioned in the previous section, and indicates that supplementary services are not yet common practice for TPLs. Only inventory management and registration, billing the final customer and advising customers about their logistics concepts exceeded the score of 1. The first two services can be considered relatively close to the existing practice of offering transportation and warehousing services. Inventory management is a minor extension from that practice, as is including a bill with a shipment to a final customer. The offering of advice on logistics strategy is an important service because it indicates that service suppliers are acting pro-actively to improve the business of their customers, offering them advice based on their experience and insight in the logistics concepts of the customer.

Even though the overall level may be low, respondents expect an increase in the level at which the services are offered for all

but one service (testing and repair of products). Important areas for growth are services such as packaging and building displays, but also the sizing and final assembly of products. This indicates how a growth of supplementary services is also expected in manufacturing activities, outside the existing transportation and warehousing practice. The final row of Table 1 shows the total average score off all of the individual items in the table. The comparison of current levels and growth expectations confirms the overall growth expectation. These findings suggest that supplementary services be considered a relevant area for the future development of operations in the supply chain by TPLs. However, it should be stated that there has not been much progress and one might question the targeted progress in that light. It becomes relevant to consider possible supply chain mechanisms such as account management and performance measurement in the development of an expanded service framework aimed at supporting a true quantum leap forward.

### **Account Management**

Having reconfirmed the modest supplementary service offerings by TPLs, the search for supply chain mechanisms TPLs can use in breaking away from this status become

even more relevant. In that respect, O'Laughlin, et al. [15], stated that a supply chain perspective is critical in efforts such as those involved in implementing postponement or the repositioning of TPLs. When applying supplementary services, the scope of the third-party logistics service expands within the supply chain. As a result, cross-company interfaces between the manufacturer and the TPL increase across functional areas not only for transport, but also for production and customization. With that in mind, the relevance of inter-organizational integration becomes apparent.

As one of the integrative mechanisms, van Dorp, et al. [16], suggested that for third-party logistics relations it is a viable concept to appoint account managers who coordinate services offered to a particular customer and serve as a single point of contact for that customer. Account managers can be seen as "boundary spanners" who contribute to the external integration of the third party and the manufacturer by coordinating services and contacts between the two organizations. Installing an account manager for a particular customer might be seen as a transaction-specific investment in terms of the transaction costs theory. However, this investment is in people, rather than equipment.

This investment may be important because the offering of these services by TPLs differs from more traditional logistics services such as transport and even warehousing in that it involves the significant specification of the operation to the specific account. Products and processes differ among customers, while transport equipment and warehouses can be used for multiple customers. Even though TPLs may have to invest in specific equipment for various industry sectors (think of refrigerated trucks for the food industry or quality controlled warehouses for electronics), this equipment can still be used for multiple customers within those industries. Supplementary services are specific or even dedicated in nature whereas traditional services are generic in nature. On the one hand, this explains the interest among third parties to start offering these services; it might result in customer lock-in as well as upgrade the supply chain to a preferred supplier of higher value-added activities. It might explain why applying account

management helps make the supply of supplementary services by TPLs more successful. Account managers can not only contribute to a more accurate understanding of the customer's product and process, more importantly they can help create the kind of dedicated and closely coordinated relationship that is needed for the operation of specific services.

In order to assess the role of account management, respondents to the 1997 survey were asked if they offered account management or not. Table 2 presents average application rates of supplementary services for the two groups of respondents, those offering account management and those not offering account management. Significance of difference has again been tested by a t-test.

Table 2 shows that seven out of twelve services are offered at significantly higher levels by respondents who apply account management than by respondents who do not. Five services are not offered at a significantly different rate by either one of the two groups. The scores for the respondents who do apply account management are higher though, for each of the five activities. Finally, scores on the individual items were summed and compared for the two groups, using a t-test. The scores differed significantly between the two groups. This test reflects the overall pattern found at the item level: respondents who apply account management are more successful in selling supplementary and postponement services to their clients, given the higher rate of application they report for these services.

As a further analysis of the role of external integration a question related to the focus of service offerings was included in the 1998 survey, which asked respondents to what extent they actively integrated the logistics chain of their customers. This question may be related to or may even be the outcome of the implementation of external integrating mechanisms such as account management and provides useful information about the role of external chain integration in general. Table 3 compares the level at which companies offer supplementary services for two groups. The first group contains respondents that are focused on integrating the customer's logistics chain (score of 1 or higher on a 6-point Likert scale). The second

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	<b>Respondents with account managers</b>	<b>Respondents without account managers</b>	<b>Significant difference?</b>
Bonded warehousing	2.24	1.14	<0.1
Packaging activities	2.60	1.69	
Final assembly	1.65	0.83	<0.05
Configuration of products	1.36	0.94	
Recondition of products	1.19	0.53	<0.1
Billing the final customer	3.05	1.75	
Testing/repair of products	0.81	0.17	<0.01
Installation of products at final customer's site	1.93	1.15	<0.05
Building displays	0.95	0.50	<0.1
Sizing of products	0.88	0.28	<0.01
Adding parts and features to products	0.56	0.31	
Total average score on items:	24.67	15.31	<0.05
Key: Scale from 0 to 6, where 0 is "never use" and 6 is "use for every customer". Independent t-test using data from the 1997 survey.			

group contains respondents that do not focus on integrating the customer's chain (score of 0 on the Likert scale).

The findings indicate that account management is a mechanism for external integration, that, like a focus on supply chain integration, contributes to the effectiveness in offering and implementing supplementary services in the context of customization and postponement.

### **Performance Measurement**

Mechanisms for internal integration, in addition to external integration, can be found in the measurement and control of operations. Williams and Lewis [17] found that companies engaged in performance measurement are more focused on offering supplementary services. In general, van Laarhoven and Sharman [18] found that TPLs perform at different levels, using different

	<b>Respondents that are focused on integrating the customer's supply chain</b>	<b>Respondents that do not focus on integrating the customer's supply chain</b>	<b>Significant difference?</b>
Packaging activities	0.75	0.46	
Final assembly	0.19	0.01	<0.05
Configuration of products	0.43	0.20	<0.01
Recondition of products	0.42	0.01	<0.01
Advising customers about their logistics strategy	1.70	1.20	
Billing the final customer	1.17	0.90	
Testing/repair of products	0.44	0.20	<0.1
Installation of products at final customer's site	0.25	0.00	<0.01
Building displays	0.28	0.01	<0.01
Receiving and inspecting return shipments	1.06	0.45	<0.05
Sizing of products	0.17	0.20	
Adding parts and features to products	0.28	0.01	<0.05
Inventory registration and management	1.83	0.98	<0.1
Total average score on items:	8.94	4.78	<0.01
Key: Scale from 0 to 5, where 0 is "never use" and 5 is "use for every customer". Independent t-test. Source: 1998 survey.			

performance indicators, depending on the type of operations in which they are active (transportation, supplementary services etc.). If this relationship exists, it may be appropriate to study what type of specific measures can support the application of supplementary services. It can be expected that expanding into supplementary services will challenge operational management of third parties. In particular, operational performance is achieved along different dimensions. Consequently, performance measurement may have to reflect these new operational dimensions in order to allow effective management of these operations, in order to maintain operational effectiveness. Combining external mechanisms to raise customization and internal mechanisms to maintain effectiveness may be crucial for making mass customization happen.

Different performance measures may be needed for the effective operation and monitoring of supplementary services. Indeed, when comparing measurement literature with a transportation focus [19] and a manufacturing focus [20], different performance measures are suggested. First, integrated logistics measures, including inventory and quality measures, may be used for supplementary services. The integrated perspective including, for example, inventory and quality considerations instead of transportation elements only is relevant given the expansion of TPLs into broader segments of the chain. Also, activities such as product configuration and packaging impact the functionality of the product and involvement in the production activities may raise quality considerations. With respect to inventory,

these activities impact the inventory policy. Manufacturers can switch to demand pull systems when product configuration and packaging is done in the distribution channel, close to the customer and avoid storing finished goods. This application of postponement may raise inventory turns and lower overall inventory levels. Changes in inventory policy and the implementation of postponement to save inventory expenses may explain why inventory management may be an important supplementary service.

A further set of relevant measures may be those specifically related to customization and production. Customization is a critical driver of supplementary services and the expansion of the TPL role in the supply chain may be to offer production activities. In summary, measurement aimed at supporting the application of supplementary services by TPLs in the supply chain may include integrated logistics measures and production and customization related measures.

For the assessment of the role and relevance of the suggested performance measures multi-item constructs were developed using varimax rotated factor analysis and cluster analysis, with Cronbach alpha's of .60 or higher. Table 4 lists these constructs and items used. On all items respondents were asked to answer using a Likert scale. The first construct reflects integrated logistics measures and includes inventory and quality measures. The second performance measurement construct uses the customer perspective through the amount of customization.

Table 5 and 6 present t-tests comparing application of supplementary services

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**Table 4**  
**Constructs and Items Used**

Constructs	Items	Construct reliability
Performance measurement 1; Integrated logistics measures (quality and inventory)	We measure transportation damage We measure current inventory levels We measure quality when receiving goods in the warehouse We measure inventory turn-around times	.76
Performance measurement 2; Production and customization	We measure the % of scrap from production activities We measure the degree to which products are produced and delivered customer-specific	.60

Data from the 1998 survey

(measured in the 1998 survey) between the groups of respondents that do and do not use these measures. Scores on the items in the constructs for performance measures were summed; the sum was recorded into two groups. The first being respondents that do not use any of the measures in the construct (summed score of 0) and the second with respondents that do use the measures (summed score of 1 or higher).

Table 5 indicates that respondents who use integrated logistics measures outscore respondents who do not, in the application of supplementary services in all but one of the items. For the service sizing of products both groups score the same rate. Seven services are operated at a significantly higher level by respondents who use integrated logistics measures. Significant differences were found along the chain; from receiving and inspecting of return shipments, packaging, installing products and billing the final customer. Also one of the final manufacturing activities, adding product features, is performed at a significantly higher level by respondents that use integrated logistics measures. The total average scores on all of the items differs significantly in favor of respondent that use the measures.

Table 6 presents findings related to the role of production and customization measures. In this analysis the respondents that

use these measures outscore those that do not on all of the services in the survey. Six services are offered at a significantly higher level. The services include the configuration of products, as well as the adding of product features, which generated a significant difference in the analysis in Table 5. As a further indication of the role of performance measures, the average summed score also differs significantly between the two groups in favor of the respondents that use production and customization measures. These findings confirm the role and relevance of adjusted performance measurement in making the transition towards expanded service offerings.

### Framework for Service Expansion

Findings from the surveys of third-party logistics operations indicate that, supplementary services in the sphere of customization and postponement are not a common operating practice for these companies. The findings indicate that TPLs perceive supplementary services as a viable extension of their operations and are moving into these services in the coming years. Their efforts to realize this contribution to the mass customization effort of manufacturers can be supported by internal and external operating mechanisms. Account management and a

	<b>Respondents that use integrated logistics performance measures</b>	<b>Respondents that do not use integrated logistics performance measures</b>	<b>Significant difference?</b>
Packaging activities	0.78	0.19	<0.01
Final assembly	0.16	0.09	
Configuration of products	0.32	0.19	
Recondition of products	0.26	0.05	<0.01
Advising customers about their logistics strategy	1.57	1.09	
Billing the final customer	1.18	0.69	<0.1
Testing/repair of products	0.36	0.23	
Installation of products at final customer's site	0.16	0.05	<0.1
Building displays	0.22	0.00	<0.01
Receiving and inspecting return shipments	1.00	0.14	<0.01
Sizing of products	0.18	0.18	
Adding parts and features to products	0.28	0.00	<0.01
Inventory registration and management	1.49	0.82	
Total average score on items:	7.92	3.69	<0.05
Key: Scale from 0 to 5, where 0 is "never use" and 5 is "use for every customer". Independent t-test using data from the 1998 survey.			

**Table 6**  
**Production and Customization Performance Measures and Services Offered**

	<b>Respondents that use production and customization performance measures</b>	<b>Respondents that do not use production and customization performance measures</b>	<b>Significant difference?</b>
Packaging activities	0.92	0.53	
Final assembly	0.16	0.12	
Configuration of products	0.54	0.20	<0.05
Recondition of products	0.62	0.12	<0.01
Advising customers about their logistics strategy	2.39	1.16	
Billing the final customer	1.16	0.92	
Testing/repair of products	0.39	0.22	
Installation of products at final customer's site	0.31	0.04	<0.01
Building displays	2.00	0.42	<0.01
Receiving and inspecting return shipments	2.00	0.42	<0.01
Sizing of products	0.16	0.10	
Adding parts and features to products	0.31	0.02	<0.01
Inventory registration and management	1.69	1.20	
Total average score on items:	11.33	5.02	<0.05

Key: Scale from 0 to 5, where 0 is "never use" and 5 is "use for every customer". Independent t-test.  
Source: 1998 survey.

focus on integrating the customer's supply chain are important, as is the expansion of performance measurement into integrated logistics, production and customization measures.

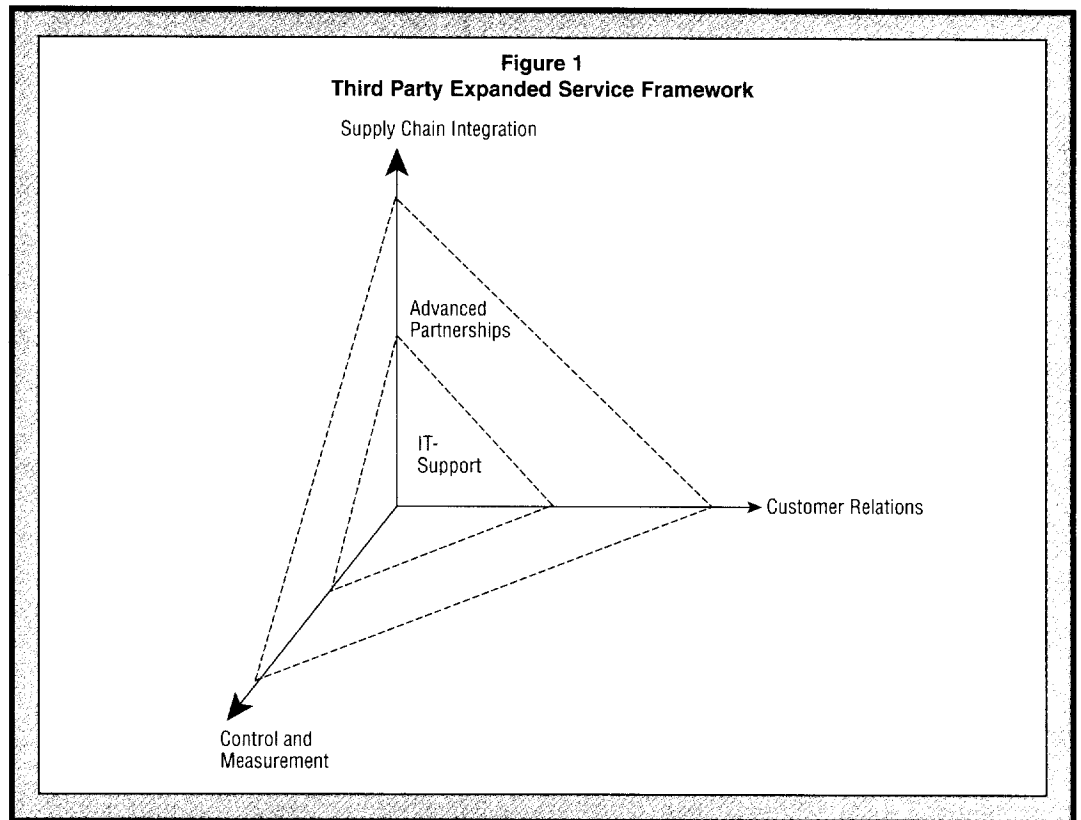
A framework can be developed that can provide TPL management with some practical guidance in upgrading their offer. Figure 1 presents the mechanisms found to be relevant for changing the status quo in TPL service offerings, in an integrated manner. Along these dimensions, which really represent mechanisms for action, TPL management can determine the depth and scope of supplementary service offerings. In pushing their efforts further, there may be initiatives that can enhance upgrading along these dimensions. First of all, IT support can facilitate efforts within the framework. Leading TPLs are now using IT tools in the tendering stage where they work with prospective clients in developing a supply chain format. They help solve supply chain problems first and only then identify possible service offerings. This works along the supply chain integration and customer relation's axes. In adding the control and measurement axis they also use integrated management

support tools, once operational, in order to virtually integrate their operations with those of the client. On-line inventory status reporting, tracking and tracing and planning for TPL management and the client further facilitate control, integration and development of customer relations.

A second relevant initiative is "advanced third party alignment", which can expand the scope of the outsourcing relation and lead to tiering the TPL business. To by-pass the possible weakness of TPLs in manufacturing, which is outside the traditional core-business some leading TPLs are now forming partnerships with industrial subcontractors to offer postponed manufacturing services. The logistics capabilities of TPLs can then be supplemented with manufacturing expertise, resulting in broader and stronger supply chain capabilities, offered as a supplier partnership to clients. Some companies take this principle even one step further by including IT specialists in the partnership or, as in the example of IBM and Nedlloyd, move from an outsourcing relation to a market partnership with a selected client. Initially, Nedlloyd had earned an outsourcing contract for transport, warehousing and postponed manufacturing

**...TPLs are now forming partnerships with industrial subcontractors to offer postponed manufacturing services.**





services from IBM in Europe. When operational, IBM services started marketing the operation as a joint IBM-Nedlloyd service, enhanced with IBM technicians. Initiatives of this kind can support the further upgrading of TPLs from low interest-low involvement to higher added value services.

### Conclusion

It can be expected that TPLs will continue to target expanded services, using an upgrading approach. Hopefully, the findings and the framework for upgrading presented in this paper can offer some guidance and support to these efforts. It can be expected that manufacturing will increasingly involve the contribution of TPLs for specific customizing initiatives, assuming that the supply chain is integrated further and further, across functions and companies. The management of these interfaces is a fundamental challenge for the 21st Century.

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