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# Management and New Production Systems

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## PREFACE

Welcome to the second conference of the recently formed European Operations Management Association.

The theme of the conference is *Management and New Production Systems* which throughout the years remains an important umbrella to combine a lot of areas within the production environment which need to be considered very precisely and consistent in order to remain competitive as a company. The contents of the proceedings is organised in an alphabetical way by author, but the large number of papers can be roughly clustered in four main areas: (i) operations strategy, (ii) implementation, including product and process innovation, (iii) operations management, and (iv) monitoring, control, performance measurement and learning. This clustering can be recovered in the organisation of the presentation sessions.

The abstracts of the papers for this conference were all double blind refereed and we would like to express our thanks to the following persons for their help in this process:

prof. Christer Karlsson (EIASM, Belgium)  
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The conference also owes considerable debt to Scania Zwolle (thanks Frans Ruffini) and Grolsch which allowed us to visit their factory in order to get better acquainted with the most modern ways of practising production management in order to get top-quality products.

Special thanks go to our key-note speakers Dan A. Werbin of Volvo/Nedcar and Christer Karlsson who gave special attention to the problems and solving methods involved in running an industrial joint venture the market-oriented way.

The delegates are the most important stakeholder in the conference and we are very glad that they took the opportunity and also the risk of visiting the University of Twente in a period that rain is very likely. Without them there would be no conference and we are looking forward to meet again in the near future.

Domien Draaijer  
Harry Boer  
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**OPERATIONAL AND ORGANISATIONAL  
JIT PURCHASING ATTRIBUTES:  
UNDERLYING DIMENSIONS AND RELATIONSHIPS**

**Measurement instrument and empirical research**

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**ABSTRACT**

On the basis of an empirical research, this study analyses the relationship between the buyer-supplier "operational link" understood as the connection between the respective operation value chain, and the "organisational link", understood as the actions of an organisational nature aimed at the selection and control, integration and qualification of sources (sometimes called: "supplier development activities"). The survey empirically documents the close connection between these two aspects. In addition, the study demonstrates that the recourse to and nature of the supplier development programs depend on the kind of the vendor-vendee operational connection. In particular, the joint development of new products seems to represent the most important factor to trigger the organisational actions activated by the buyer firm

**INTRODUCTION**

World class manufacturing, that is the "set of processes designed to achieve a suitable global competitive advantage" [1] places particular emphasis on buyer-supplier interaction practices and on the role of the suppliers as part of the same extended production system. The "rediscovery" of the role of procurement activities in the effective implementation of the new production models is relatively recent: the first contributions which specifically focused on the impact of the JIT practices on procurements go back to 1983 and were the work of Schonberger and Gilbert [2] and Hahn, Pinto and Bragg [3]. These contributions inaugurated a sphere of studies relating to buyer-supplier operational and relational practices promoted by the new approaches to operations: JIT Purchasing. The interdisciplinary character of the JIT P. studies and the heterogeneity of its attributes was recently pointed out by Stamm and Goldhar [4] following extensive bibliographic search. At present it lists three categories of attributes:

1. attributes of an operational nature, that is connected to the link between buyer's and supplier's operation chains (primarily in design and production-logistics);
2. attributes aimed at the creation and maintenance of a network of competent suppliers, i.e. actions directed towards the selection of new sources, their technical qualification, the monitoring of their performance, the provision of incentives for continual improvements [5]. These attributes are often identified in literature as "supplier development" activities;
3. attributes directly related to the basic options of the firm's purchasing strategy. In other words the choices which specify "how" to relate to the sources (i.e. the number of suppliers, single or multiple sourcing), "what" (preferred purchasing typologies, choice of product) and "where" to purchase (sourcing areas) [6].

It can be hypothesized that these three classes of attributes are closely linked. In fact new forms of buyer-supplier operational collaboration:

- modify the vendor-vendee relationship context by virtue of the different nature and the extension of their interaction. Traditional procurement policies, regarding, for example the choices of the

number of sources with which to establish an advanced relationship and of the sourcing area, need to be revised;

- give high importance to supplier's development activities. The extension of the area of buyer-supplier interdependence, and the consequent greater stability and exclusivity of relationship, underline the decisive importance of the choice and activation of suitable instruments in the selection, evaluation and control, organisational integration and motivation of the sources. Aspects therefore aimed at the identification and development of a pool of suppliers able to respond to the more complex requirements set out by the new production systems.

Lyons et al. [7] note that, as co-operative models of the buyer-supplier relationship become accepted, the need increases for suitable tools to "bring-up" an adequate pool of suppliers and evaluate their effective co-operation. The above cited bibliographic review by Stamm and Golhar [4] highlights two other important elements: a) the study of the relationship-interdependencies between these different JIT P. attributes and classes of attributes is still largely unexplored, b) a limited number of papers regard empirical research.

**OBJECTIVES OF THE STUDY**

The subjects of this study are the attributes which create the link between the operation chains of the buyer and the supplier and the attributes aimed at the selection, integration, qualification and control of the sources (supplier development activities). Using a terminology introduced by Ansari and Modarress [8], we shall define the first set of attributes as "operational link" and the second as "organisational link".

The aim of the study is to analyse, through an exploratory empirical research, the relationship between the operational and organisational JIT Purchasing attributes. The hypothesis on which this research is based is that a close relationship exists between these two set of attributes.

The paper is laid out along the following lines. First of all a presentation and brief description of the operational and organisational JIT Purchasing attributes examined. This is followed by the explanation and justification of the methodology adopted in the survey. Finally, the main results are discussed.

**ASPECTS ANALYSED**

The areas and aspects of the "organisational link" taken into account are:

- **Supplier evaluation and selection.** According to several contributions, the redefinition of the relationships with the supplier according to a collaborative logic calls for a broader knowledge and control of the sources [9] [10] [11] [12]. From this arises the need for specific and formal procedures of supplier evaluation and selection. An aspect which is being discussed more and more in the literature is the so called "team buying", which consists in assigning the responsibility for identifying and selecting suppliers to a team of professionals from different organisational units. Studies by Lyons et al. [7] and Willis and Huston [13], demonstrate how the use of multifunctional purchasing teams is spreading into an increasing number of industries.
- **The buyer-supplier organisational integration.** The broader buyer-supplier interdependence area involves not only sales forces (on one side) and purchasing forces (on the other) but also other departments within both organisations (such as design, production and quality control). It is therefore necessary to have joint organisational buyer-supplier interfacing procedures and roles capable of guiding this wider interaction. This is an aspect which has not been sufficiently studied in depth in the literature. Helper [14] is one of the few contributors, who from an empirical survey notes that a supplier performance improvement takes place when buyers and suppliers interact intensively and exchange visits. We quote in addition Dumond and Newman's [15] and Clark and Fujimoto's studies [16], which point out the importance, when



designing and industrialising new products, of organisational devices aimed at simulating and gathering technical suggestions from the suppliers.

- **Supplier assistance and training.** The need for supplier assistance and training has often been debated in the literature. Bache et al [10] and Das and Goyal [9], note, for example, the need to assign resources to assist the suppliers in the development of an effective operational link. These should be mainly directed to the areas of quality (statistical process control) and equipment-maintenance. Inman [18] discusses the importance, in the implementation of the TQM programs, of training courses aimed at making the suppliers aware of problems involved in quality. The establishment of interactive relationships with suppliers, observe Lysons et al. [7], replace the traditional approach of substituting inefficient sources with the supplier support and assistance.
- **Supplier incentives.** This study has analysed contractual incentives as one of the mechanisms which stimulate supplier's development. According to Newman [16], the supply contract has to take into account the costs sustained by the supplier to implement programs of statistical process control, modifications and or modernisation of productive assets, and for redesigning of facilities to allow a smoother running of the operations. In other words the supply contract should compensate the vendor for additional costs encountered when changes are made in production and logistic distribution areas in order to motivate the development of the sources [19]. Das and Goyal [9] observe that the operational success of a JIT system can only be sustained if the rewards received by the vendors are proportionate to their contribution to the system.

The areas of operational link taken into consideration in the study are:

- **Product development.** Several studies and empirical observations have demonstrate the importance of the early supplier involvement in product development [17] [20] [21] [22]. The benefits of a collaboration with the sources in the design stages may be summarised as follows [23]: reduction in development costs (early availability of prototypes, consistency between design and supplier's capabilities, reduced engineering changes), improvement in the product quality level, reduction in the overall development time (due to the early identification of the supplier's technical problems, joint decisions regarding materials and components) possibility of incorporating supplier originated innovations.
- **Production planning and scheduling.** Frequent and small-lot supplies (typical of JIT environments) require synchronisation between the order contracting, planning and scheduling activities; this promotes the integration of the production planning stage and control systems. This type of integration takes place on three levels [24]. The first level is the one where the supplier is informed of the material needs according to the aggregate demand forecasts. Typically, this leads to the drawing up of open purchase orders. The second level corresponds to the transmission of the production plan to the supplier. The integrated production planning system, i.e. ordering system linked directly to the manufacturer's production system, allows the supplier to anticipate his client's requirements therefore improving adherence to the schedules set out. Finally a delivery plan operated according to a pull logic allows the materials to be shipped directly to the buyer's plant. In the short run both production authorisation and the movements of materials from the supplier can be achieved with the use of kanbans.
- **Distribution.** The JIT supply system involves a reduction in the purchasing quantity per shipment and an increase in the frequency of supplies. JIT deliveries, that is synchronised to production requirements, are probably the most discussed attributes in the literature [1] [25] [23]. There are three further aspects which are closely connected to this in the literature:

- + The need for quality at source. The main objective in JIT is to eliminate any source of waste and increase the rate of material flow. The elimination of buffer stock and specifically the reduction or elimination of incoming stock inspections, is possible only if the quality of the suppliers is high on a consistent basis. This creates the need for certified supplies.
- + The congruence of packaging. According to Newman [16], frequent and small-lot deliveries underline the importance of the vendor-vendee packaging congruence: the use of standard, re-usable, automatically identifiable containers can help speed up incoming procedures to the advantage of the flow rate.
- + The geographical proximity of suppliers. According to several authors, in order to provide JIT deliveries it is preferable for the suppliers to be located near the buyer's plant. The geographical proximity of the sources reduces delivery costs and allows a more reliable service [8] [11] [16].

The interaction between the supplier and the buyer within these three operational areas is supported by an extensive communication flow [26]. This kind of mutual information exchange mainly regards the product (design simplification and product modularization, component standardisation, choices regarding materials) the process ( production cycles and equipment combined definition of the process) and the quality (joint definition of quality specifications, transmission of quality tests and charts, transfer of statistical process control data).

## METHODOLOGY

The methodological steps followed can be summarised in these points:

### Research approach and survey strategy.

The study undertaken is of an explanatory nature as its intention is to verify and analyse the relationship between concepts which occupy a specific area of analysis (buyer-supplier interaction).

Thus recourse was made to a survey, taking the plant as a unity of analysis.

The sectors sampled are those of electronics and machinery (including some auto-suppliers) in which the interaction with the suppliers is a competitive variable of increasing importance. The sample, selected at random among plants employing more than 100 people, is stratified into two levels: "traditional " and "world class reputation" plants. These were selected consulting specialised magazines and following the advice of experts in the sector.

The data and elaborations formulated in this study refer to a sample of 37 units and 424 respondents.

### The development of the measurement instrument

The operationalization process of each attribute has lead to the identification of one or more indicants each of which represents a more or less extended portion of the domain of content of the attributes taken into account.

In the case where the attribute was complex (=related to several aspects) and not directly observable, perceptual multi-item measures were adopted. In this case the operationalization was carried out using 5-point Likert-scales. The items of each scale were spread out through the questionnaires (in order to prevent the respondents from recognising the construct analysed) and addressed to at least three respondents (the purchasing, plant and production managers). Some of the questions were addressed also to the Quality Managers, Process Engineer, Information System Manager, two supervisors and four workers for a total of 12 respondents for each plant. The questionnaires were pre-tested on a limited number of firms.



### The measurement instrument validation

- Reliability assessment. The two components of reliability, that is stability and equivalence (see for example [27] [28]), were verified in the following manner:
  - + the test-retest method. The correlation of measurement over time proved satisfying ( $0.5 < r < 1$ ) for all the constructs verified.
  - + the Cronbach's alpha test. All the constructs (except one which was marginally shorter) have an alpha value greater than the cut-off value (0.6) that is suggested as acceptable for empirical research of this nature [29].
- Validity assessment. The main types of validity, i.e. content validity and construct validity were verified respectively:
  - + by a review of the literature, the theoretical revision used by the research group, a comparison with some managers of the firms sampled.
  - + by using factor analysis for the uni-dimensionality test of constructs. The scales used showed high validity and only in certain cases the existence of more than one underlying dimension led to the elimination of certain items (although the inter-item correlations coefficients were significant).

Table 1 provides a summary of the measurements used and their reliability coefficient.

	Cronbach's alpha
<b>ORGANIZATIONAL LINK</b>	
Vendor rating/ranking proced. (3-scale construct)	0.94
• Presence of specific procedures (3-item scales)	0.86
• Level of formalization of procedures (4-item scale)	0.52
• Team buying (4-item scale)	0.78
• Organisational buyer-supplier interfacing proced. and roles (4-item scale)	0.77
• Supplier assistance and training (scale) (5-item scale)	0.85
• Contractual incentives (scale) (3-item scale)	
<b>OPERATIONAL LINK</b>	
<b>PROD. DEVELOPMENT</b>	0.87
• Early supplier involvement (4-item scale)	
<b>PRODUCTION PLANNING AND SCHEDULING</b>	0.68
• Shared production forecasts (open purchase orders) (2-item construct)	0.74
• Integrated production planning (3-item scale)	0.92
• Pull (kanban) procurement approach (3-item scale)	
<b>DISTRIBUTION</b>	0.76
• JIT deliveries (frequent and in small lots) (3-item scale)	-
• Free pass for deliveries	0.79
• Recourse to certified suppliers (3-item scale)	0.68
• Packaging congruence (3-item scale)	-
• Supplier geographical proximity	
<b>INFORMATION EXCHANGE concerning:</b>	0.79
• Product development (3-item scale)	0.97
• Production process (3-item scale)	0.91
• Quality practices (4-item scale)	

Tab. 1. Summary of measures

### DATA ANALYSIS

A principal component factor analysis was carried out on the operational variables. In fact, most of the attributes analysed were found to be strongly correlated to each other, thus showing their close conceptual interdependence. Using the principal component factor analysis, the number of variables could be reduced to a few orthogonal factors, thus eliminating multicollinearity problems in the successive analyses. In order to more clearly identify the underlying dimensions and interpret their composition, the orthogonal factor rotation was applied. For this purpose the "VARIMAX"

algorithm [30] was adopted, which maximises the variation of squared factor loading for each component. The rotation was limited to the first five components, in view of the fact that they account for the biggest portion of variation (75%) (criterion of cumulative proportion of total variance). The rotated matrix of factor loading is shown in table 2.

The orthogonal factor rotation locates:

- a factor (the second in table 2) on which the attributes of "free pass deliveries", "information exchange on quality", "supplier certification" converge. It accounts for more than 17% of the total variance and is defined from here on as "interaction on quality".
- a factor (the third in table 2) on which the attributes of "JIT deliveries", "open purchase orders" (shared forward call-off plans), "pull-kanban procurement approach" converge. It accounts for more than 14% of the total variance and is defined from here on as "delivery synchronisation".
- a factor (the sixth in the table) on which the attributes "supplier's involvement in production development", "information exchange on the product" and "information exchange on the process" converge. It accounts for more than 16% of the total variance and is defined from here on as "interaction of design-product development".

FACTOR ANALYSIS: VARIMAX ROTATION FACTOR LOADINGS

	Fact. 1	Fact. 2	Fact. 3	Fact. 4	Fact. 5
Infor. exch. on product	<u>0.849</u>	0.138	0.265	-0.080	0.136
Infor. exch. on process	<u>0.749</u>	0.002	-0.240	0.350	0.284
Suppl. involv. in prod. devel.	<u>0.671</u>	0.412	0.266	-0.138	0.263
Free pass for deliveries	0.169	<u>0.814</u>	0.052	-0.076	-0.025
Infor. exch. on quality	0.073	<u>0.791</u>	0.186	0.379	-0.050
Supplier certification	0.133	<u>0.578</u>	-0.316	0.519	0.211
Open purchase orders	0.134	0.068	<u>0.824</u>	0.045	0.305
Pull-kanban approach	0.240	0.053	<u>0.608</u>	0.597	-0.015
Jit deliveries	-0.010	0.480	<u>0.524</u>	0.088	0.421
Operational proximity	-0.065	0.096	0.090	<u>0.753</u>	-0.047
Integrated prod. plann.	0.152	0.016	0.097	-0.013	<u>0.843</u>
Packaging congruence	0.275	0.000	0.220	-0.014	<u>0.746</u>

PERCENT OF TOTAL VARIANCE EXPLAINED BY ROTATED COMPONENTS

	1	2	3	4	5
	16.34	17.14	14.37	12.48	14.64

Tab. 2. The rotated matrix of factor loadings

A canonical correlation analysis was then carried out between the principal components identified from the previous analysis and the group of the four organisational variables. The remaining operational dimensions were excluded for two reasons: 1) their characterisation was uncertain, 2) the percentage of variation they explained was modest. On the operational side, the factor scores associated with the three principal components were used. This was done in order to take into account the weight of each variable in the corresponding factor.

Table 4 shows the results of the canonical correlation analysis. The results of the test may be summarised in the following way:

1. the macro-organisational area is closely connected to the macro-operational area. In fact, the first canonical correlation coefficient is quite large (0.683) as is the second coefficient (0.606). Furthermore the statistical significance ( $p < 0.001$ ) of the first canonical variate is high while the redundancy coefficients is satisfactory. In statistical terms, approximately 29% of the variance of the organisational link is justified by operational link practices. The implementation of advanced



vendor-vendee interaction practices in the design and production-logistics areas goes hand in hand with a wider participation in supplier's development. Nevertheless the different operational dimensions do not play a homogeneous role in determining such a link;

- the dimension "interaction on design-product development" shows a marked correlation with the entire group of organizational variables, in particular with the variables "supplier assistance and training" and "organizational buyer-supplier interfacing procedures and roles" (respective factor loadings: 0.929 and 0.735). In fact, the first canonical variate (responsible for the greater part of the shared variance) is dominated by the variables just mentioned.
- The dimension "interaction on quality" shows a particular affinity with the supplier selection and evaluation methods used by the buyers. In fact, the second variate is dominated by the variables "specificity and formalization of vendor rating/ranking processes", in the first group, and "interaction on quality" in the second.

It should be noted that the link between organizational variables - interaction on design is much closer than that between organizational variables - interaction on quality / delivery synchronisation (= production and logistics link). The first variate accounts for 45% of the variance of the organizational variables. The second and third for 19% and 15% respectively.

	first canonical variate	second canonical variate	third canonical variate
<b>CANONICAL CORRELATIONS</b>	0.683	0.606	0.101
Redundancy $R^2$ (operational $\rightarrow$ organizational)	21 %	7 %	< 1 %
Redundancy $R^2$ (organizational $\rightarrow$ operational)	13 %	12 %	< 1 %
statistical significance (Bartlett test)	p = 0.000	p = 0.021	p = 0.849

  

organizational link	canonical loadings	canonical loadings	canonical loadings
contractual incentives	0.311	-0.622	0.459
organisational buyer-supplier interfacing procedures and roles	0.735	-0.007	-0.347
specificity and formalization of vendor rating/ranking proc.	0.549	0.626	0.478
suppl. assistance and training	0.920	-0.011	0.145
explained variance	45 %	19 %	15 %

  

operational link	canonical loadings	canonical loadings	canonical loadings
interaction on quality	0.436	-0.900	-0.023
delivery synchronisation	0.299	0.146	-0.943
interaction on design	0.733	0.406	0.545
explained variance	27 %	33 %	40 %

Tab. 3. Canonical correlation: results

## DISCUSSION

In the following paragraphs the link between each operational dimension and the organizational variable examined is discussed and compared.

### 1) Interaction on quality - organizational practices.

The implementation of JIT programs underlines the need for suitable vendor rating/ranking tools. The reduction in inventory and in general in slack resources needed to cope any disruption in the progress of material flow, places the buyer in a more vulnerable position in regard to late or non conformity of supplies. Deliveries organised on a JIT basis require the quality control at source, achieved starting from rigorous programs of supplier selection and evaluation. This dimension is also linked with the variable "contractual incentives": better contractual clauses are obviously granted to suppliers who offer suitable quality guarantees.

### 2) Interaction on design - organizational practices

The interaction on design seems to be closely linked with the supplier development actions of the buyer and in particular with the variables: "organizational buyer-supplier interfacing procedures and roles" and "supplier assistance and training". The most obvious reasons seem to be the following:

- the collaboration in product development is a complex and demanding operation for both parties involved. This therefore leads to more decisive and extensive actions of organizational integration. According to Burt [31], this phenomenon can be for example easily observed in the electronics and automotive industry: the prompt and efficient interaction/integration between designers and product engineers from both companies demonstrates the need for specific organizational roles and co-ordination tools.

the supplier's participation in the design of the product, and therefore the admittance of external designers into the development teams, characterises realities structurally and culturally receptive to the contributions of the sources. Gupta [25] observes that the involvement of the suppliers in product development implies, above all, a cultural change. This process in fact not only inverts a tradition of antagonistic behaviour, but it also renders the organisations more transparent with each other creating long-term relationships and joint optimisation.

### 3) logistic link - organizational practices VERSUS interaction on design - organizational practices

An interesting result emerging from the canonical correlation analysis is the fact that the type of operational interaction (on delivery synchronisation, quality and design) is a discriminating factor in relation to the organizational practices used by the firms. In particular, the interaction on design is more closely linked to the buyer's actions of supplier development than the logistic link (i.e. interaction on quality + delivery synchronisation). This result is not greatly supported by the literature which instead places more emphasis on the role of the buyer in the development of an inter firm logistic network. In the literature the reasons hypothesised to justify the close correlation between buyer-supplier logistic link and supplier development activities can be summarised in the following manner:

- JIT supply, that is frequent (in small lots) and well timed (with short delivery lead times), requires the supplier to suitably reshape his own production and logistic system, adopt appropriate quality control methods and implement compatible management systems. This is obviously true only if the supplier responds to the buyer's JIT delivery needs without increasing his stock. According for example to Gupta [25], these changes in the supplier's plant often would be most difficult to carry out without the direction and assistance of the buyer's firm, especially if located at the end of the manufacturing chain.
- an increase in the frequency and reliability of supplies leads to additional costs for suppliers, for example in scheduling, handling and packaging activities. JIT interaction is therefore linked to appropriate contractual incentives in order to compensate the supplier for a greater quality and service content and increased costs sustained. According to Newman [16], these incentives are: rewards for improvements in quality and delivery reliability, greater stability of relationship (longer contracts).

An evolutionary perspective like the one suggested by Nelson and Jambekar [32], could partly justify the different intensity of relations between logistic and design link and organizational variables. According to them, the process of establishing advanced relationships with the sources is accomplished by degrees. The extent of the supplier's operational involvement varies according to the stage at which the relationship is. At first the operational involvement concerns the greater transmission of information regarding quality, production scheduling and progress of the material flow. This is followed by supplies on a JIT basis and it concludes with the supplier's involvement in product development. One can therefore hypothesise that, approaching more advanced stages of



operational interaction, the buyer's intervention in favour of the pool of suppliers is intensified and extended. They initiate with more accurate and sophisticated procedures of auditing and selection and follow up with a gradual qualification of the pool of suppliers. Finally they reach the area of organizational integration (where organizational roles are specifically planned).

Statistical analyses carried out do not disprove this hypothetical development. In fact, as the area and size of the operational interaction increases, so does the intensity of the organizational link. However, the analyses of canonical correlation highlights how in the triggering of organizational actions the most important factor is the interaction between the buyer and the supplier in the product's development: a considerable portion (45%) of the explained variance of the organizational variables are associated with the corresponding canonical variate. These are the possible reasons:

- supplier development initiatives, in particular supplier assistance and training, are for the most part investments which the buyer cannot recover in the event of a termination of the relationship. Therefore they can be more easily justified when the relationship is more selected, exclusive and binding, as occurs when there is collaboration at the design stage;
- the most distinctive capabilities from the buyer's point of view, that is the capabilities which make the supplier a resource in which to invest, are those that the supplier can put back into the product (for example material selection, joint development of prototypes, value analysis, reduction or standardisation of the components). In other words, the buyer provides support to the suppliers especially when they prove they are able to increase the value of the object supplied and of the final product rather than to the logistics distribution process.

## CONCLUSIONS

On the basis of an empirical research, this study has analysed the operational and organizational aspects of the interaction between buyer and supplier. These are aspects which have often been debated in the literature in the context of JIT Purchasing attributes. The results obtained can be summarised as follows:

- the study empirically documents a close connection, often discussed in the literature, existing between the buyer-supplier operational link and the supplier development practices of the buyer;
- the relationship is strictly linked to the type of operational interaction between the customer's organisation and the suppliers. In particular the interaction on design, within the framework of a close connection with the whole group of organizational variables, accompanies more widespread assistance and training programs and organizational integration. Interaction on quality is instead linked to specific tools of supplier selection and evaluation;
- the joint development of new products seems to represent the most important triggering factor for the organizational actions set in motion by the buyer firm. This finding has little support in the literature which places great emphasis on the role of the buyer in the setting up of an appropriate inter-firm logistic network.

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