Research Journal of Recent Sciences ____ ISSN 2277-2502
Vol. **4(11),** 103-114, November **(2015)** *Res.J.Recent Sci.*

Operations Practices and Competitive Priorities: Impact of the Operations Strategy on Performance

Díaz-Garrido Eloísa, Martín-Peña, María Luz Sánchez-López José María
Rey Juan Carlos University, P Artilleros, s/n 28032 Madrid, SPAIN

Available online at: www.isca.in, www.isca.me
Received 23rd May April 2014, revised 31st October 2014, accepted 12th June 2015

Abstract

Despite the significant attention that part of the literature has devoted to the operations strategy, most studies analyse the different variables involved in isolation. This paper proposes a theoretical model to identify the causal relations between three key variables in operations management: operations practices, competitive priorities, and firm performance. The data for this study come from Spanish industrial firms belonging to various sectors of activity, and the hypotheses are tested using structural equations analysis. The more important findings are that if firms design an operations strategy on the basis of a greater number of structural and infrastructural practices, they will be able to improve their competitive advantages in operations. The results also show that competitive priorities in operations can have a direct, positive effect on firm performance.

Keywords: Operations strategy, operations practices, competitive priorities, structural equations.

Introduction

Researchers in strategic management have proposed a different perspective on the achievement of competitive advantage. This alternative view consists of a move from an environmental and market-based (or outside-in) perspective, to one that uses a resource-based and associated dynamic capability (inside-out) approach to increasing competitiveness[1]. Dangayach and Deshmukh[2] identify areas of possible future research, including the need for inside-out focused operations strategy research.

Numerous connotations exist to define the term ‘operations strategy’. Nevertheless, it appears that there is consensus on certain issues, for instance, that manufacturing strategy must support competitive strategy and corporate objectives[3,4], also facilitate manufacturing objectives in order to achieve a competitive advantage[5] and be focused on a uniform decision-making model within the category of key manufacturing resources[5-7]. Any definition of manufacturing strategy must include two key elements, competitive priorities and manufacturing decisions and practices.

Several studies in operations management have investigated alignment between business and functional level strategies [8, 9]. The problem is that despite the significant attention that part of the literature has devoted to the operations strategy, most studies analyse the different variables involved in isolation. Thus some papers focus on the manufacturing practices[10-13], and others on the competitive priorities[14-17] and their relation to firm performance. There is consequently a need for integrated studies that analyse the fit and coherence between the operations practices and the competitive priorities in operations, and the impact of this fit on the performance.

The current work proposes a theoretical model that postulates a number of causal relations between three key variables in operations management – operations practices, competitive priorities, and firm performance – and then empirically tests the hypotheses concerning the proposed relations. Thus the authors overcome the limitation of other studies that only analyse correlations between pairs of variables[18].

The current work should shed light on the operations strategy, and help researchers test its effects in practice, since it jointly analyses the relations between the operations practices, competitive priorities, and firm performance as measures of strategic fit. Two implications derive from this work. First, the work aims to shed light on the operations strategy by describing and analysing the formalisation of the strategy and examining its relation to competitive advantage in operations and the firm’s performance, under the assumption that the two elements making up the content of this strategy (competitive priorities and operations practices) need to be consistent. Second, the research should prove useful in the design and implementation of the operations strategy in organisations, and help guide future research in this area.

The rest of this work is structured as follows. The next section presents the research model consisting of the proposed relations and hypotheses. The third section describes the methodology, which includes the selection of the items used in the empirical analysis, the selection of the sample from which the data is collected, and the data collection and validation through validity and reliability analyses. The empirical analysis uses structural equations, and the results follow. The final section outlines the main conclusions of the research.

Research model and hypotheses: A key concern of scholarly research in operations management is the contribution of operations strategy to business performance[18,19]. As a result of the decisions that the firm adopts, it can create a structure that enables it to acquire a series of capabilities. The capabilities developed in this functional area have a direct effect on the design and formulation of the most appropriate operations strategy, providing the key to developing the potential of the operations area as a competitive weapon. Thus when a company defines its strategic position, it can focus on the competitive priorities for which it has specific capabilities.

The practices that make up the operations strategy can be either structural (capacity and location of plant, technology used in process, level of vertical integration) or infrastructural (quality management, human resource management, production planning and control systems, organisation). The competitive advantage of the operations functional area can be achieved through aspects such as cost, quality, deliveries (quick and on time), flexibility (in product and in process), service, and environmental protection.

Figure-1 presents the analytical model. According to this model, the set of practices that make up the operations strategy has an effect on firm performance both directly and indirectly through the competitive advantage achieved in the production and operations functional area. This work proposes four hypotheses about the relations between the operations practices making up the operations strategy, competitive priorities in operations, and firm performance.

The operations strategy that firms define allows them to achieve competitive priorities in aspects such as cost, quality, flexibility, deliveries, service, and environmental protection, because if the firms adopt certain practices in operations structure and infrastructure they can achieve capabilities upon which to base a competitive advantage.

Different authors suggest that operational performance is influenced by the implementation of bundles of manufacturing practices[11,20,21]. On the basis of the above considerations, the first hypothesis is as follows:

Hypothesis 1: Firms that design and implement an operations strategy on the basis of a larger number of structural and infrastructural practices achieve more competitive advantages in production and operations.

To operationalise the operations strategy it is necessary to analyse the competitive priorities, since they orient the decisions to adopt and the practices to carry out within the manufacturing structure and infrastructure. In other words, if managers are to achieve their operations objectives and develop competitive advantages in the operations area, they must decide what practices are the most appropriate[17, 22] to align the manufacturing capabilities with the business strategy.

A large number of studies have confirmed the relation between competitive priorities in operations and structural and infrastructural practices[23, 24, 25]. The determinant factor behind the success of an operations strategy is the way the competitive priorities translate into a set of practices, and the degree of fit between both dimensions offers the key to develop the potential of the production function as a competitive weapon[26, 27]. The second hypothesis follows:

Hypothesis 2: The competitive priorities developed have a direct effect on the design of the most appropriate operations strategy (structural and infrastructural practices).

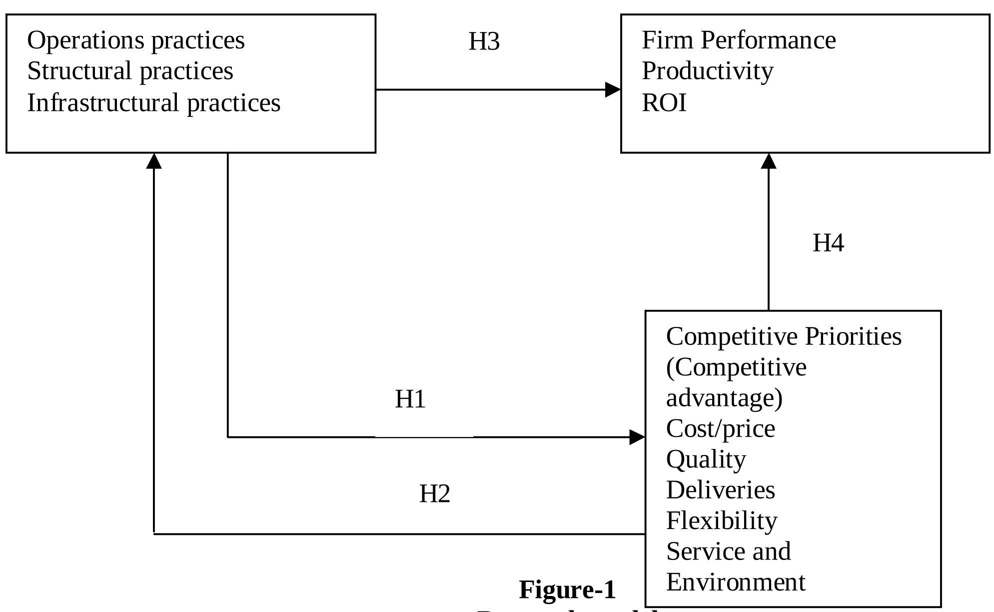

Figure-1
Research model

A key concern of scholarly research in operations management is the contribution of operations practices to business performance[19], because operations practices are only valuable if they enhance the performance of an organisation relative to its chosen goals[18]. A strong management commitment towards adopting the practices making up the operations strategy is associated with superior performance[23].

In recent years a number of studies have analysed the relation between operations practices and performance[2,10,11,28]. The majority finds that implementing more operations practices is associated with superior performance.

Hypothesis 3: Firms that design and implement an operations strategy on the basis of a larger number of structural and infrastructural practices achieve superior performance.

The literature suggests that the results achieved by the operations function contribute to improving firms' performance and consequently their overall competitive advantage[29]. In other words, achieving a competitive advantage generally suggests that the organisation can develop one or a number of the following operations priorities compared to its competitors: lower costs, higher quality, greater flexibility, more reliable deliveries, better service, and stronger environmental protection. This competitive advantage can lead to superior firm performance.

A large number of empirical studies indicate that developing advantages in aspects such as quality, deliveries, flexibility, and/or cost has a positive effect on firm performance[16, 23, 29, 30].

Hypothesis 4: Firms that design and implement an operations strategy on the basis of a larger number of competitive priorities in operations will achieve superior performance.

Methodology

Appendix A reports the items selected, on the basis of the literature review, to measure the variables of the analytical model: operations practices, competitive priorities, and firm performance.

Specifically, with regard to the practices making up the operations strategy, the authors consider capacity and location, technology, vertical integration, environmental protection programmes, human resource management, quality management, production planning and inventory management, and organisational structure. The questionnaire asked the respondents to say if their production unit carries out investment in each particular practice or policy or not, and to indicate the importance their firm accords it using a 7-point Likert scale (1=not important at all, 7=highly important). For competitive priorities this work considers the following competitive priorities: cost, quality, flexibility, deliveries, service, and environment. The respondents were asked to assess their firm's position in relation to its best competitor for each competitive priority, using a 7-point Likert scale. To measure the performance the authors use secondary sources of information (Dun and Bradstreet database or Dicodi). Thus the authors calculated the arithmetic mean value over three accounting years of the firm's ROI and productivity indicators.

The authors built their own database using information taken from Dun and Bradstreet's directory of 50,000 top Spanish firms. Specifically, they extracted a sample of firms to carry out the empirical study, using the following criteria:

Industrial firms belonging, according to the Spanish classification of economic activities (CNAE), to: DJ (Metallurgy and Manufacture of Metallic Products), DK (Manufacture of Machinery and Mechanical Equipment), DL (Electrical, Electronic and Optical Materials and Equipment), and DM (Manufacture of Transport Materials).

Firms with more than 50 employees: A total of 1820 firms complied with the above criteria and consequently form part of the current study.

The authors chose to use these industrial sectors for various reasons. First, these sectors have been the most commonly analysed in the specialist literature[2]. Second, firms from these sectors typically have big turnovers and higher-than-average industrial production indices, so they can be considered as making up the industrial backbone of developed countries.

As primary source of information the authors used a questionnaire, which they sent by post to each firm from the selected sample, and specifically to the operations manager, or failing this, the chief executive. Before sending the definitive version the authors carried out a pre-test in order to test the validity of the questionnaire designed. This involved conducting personal interviews with both academics and operations management specialists from five companies from the sample.

The definitive questionnaire comprised questions designed, to evaluate the firm's competitive priorities and operations practices. The total number of valid questionnaires received was 353, equivalent to a response rate of 19.53%.

Before the empirical analysis, the authors tested the unidimensionality, reliability and validity of the scales used to measure the variables shown in Appendix A. If a unique factor underlies the set of variables making up a scale, it is unidimensional. In table- 1, to test unidimensionality the authors carried out an exploratory factor analysis (principal components analysis method, with varimax rotation). For the operations practices, 34 items measuring the 7 dimensions were considered. The cumulative variance explained by the 7 factors is 59.8%. Each of the 34 items loads significantly (greater than 0.4) on at least one factor.

Table-1
Results of factor analysis for variable "operations practices"

Items	1	2	3	4	5	6	7	Factors
Expand workers' responsibilities	.759	.124	.309	.010	-.001	.008	.185	Factor 1 HRM and Organisation
Team work	.727	.187	.245	-.016	.069	.006	.121	
Improve manager-worker relations	.695	.062	-.027	.186	.159	.088	.031	
Decentralisation of decisions	.663	.102	-.069	.152	.123	.090	.077	
Increase variety of workers' tasks	.633	.039	.237	.195	.029	.185	.165	
Worker training	.563	.421	.151	.221	.029	.003	.164	
Improve quality of life in work	.509	.352	.147	.125	.019	.239	.011	
Multi-functional project teams	.503	.115	.106	.095	.138	.457	.027	
Manager training	.401	.316	.066	.276	.073	.120	.217	
Statistical control of quality	.078	.710	.131	.265	.092	.067	.137	Factor 2 Quality
ISO 9000	.138	.654	.083	.034	.010	.217	.227	
Quality circles	.093	.647	.084	.125	.084	.154	-.014	
Total Quality Management (TQM)	.285	.612	.001	-.023	.120	.444	.057	
Zero-defect programmes	.116	.598	.056	.015	.305	.216	.009	
Preventive maintenance	.278	.556	.100	.132	.253	-.021	-.022	
Restructuring of plant	.190	.043	.810	.209	.120	.048	.039	Factor 3 Capacity of plant
Redistribution of plant	.137	.077	.808	.198	.061	.137	.037	
Investment in plant, equipment and RandD	.069	.111	.585	.002	.170	.143	.233	
Expand plant capacity	.205	.190	.536	.137	.118	-.051	-.010	
Reduce production cycle and delivery time	.214	.117	.188	.760	.145	.057	.041	Factor 4 Production planning and control
Production and inventory control systems	.138	.226	.248	.713	.175	-.028	.164	
Just-in-time purchase management	.181	.133	.059	.527	-.077	.183	.272	
Continuous improvement	.310	.419	.196	.514	.136	-.061	-.014	
Computer-aided design (CAD)	.054	.163	.073	.155	.771	.126	.177	Factor 5 Technology
Flexible manufacturing systems	.147	.168	.125	.021	.712	-.049	.070	
Robots	.078	.104	.064	.166	.540	.196	.004	
Computer-aided manufacturing (CAM)	-.038	.073	.249	-.168	.497	-.078	.456	
Reduce machine preparation time	.375	.219	.151	.340	.438	.046	-.103	
ISO 14001	.064	.327	.040	.042	.012	.803	.087	Factor 6 Environment
Environmental management systems	.220	.306	.128	.029	.157	.750	.032	

Items	1	2	3	4	5	6	7	Factors
Subcontraction	.106	.008	.043	.050	.096	.013	.780	Factor 7 Vertical integration
Cooperation with suppliers	.262	.201	.070	.249	.051	.018	.645	
Integration of IS with suppliers	.203	.132	.023	.130	.133	.260	.589	
Location and re-location of plant	.003	.213	.180	-.033	.080	-.205	.407	

The authors initially measured competitive priorities using 18 items representing 6 dimensions (cost, quality, flexibility, deliveries, service, and environment), as table- 2 shows. Nevertheless, the exploratory factor analysis resulted in 5 factors with a cumulative variance of 61.58%. Flexibility "disappears" as a single dimension. Part of this dimension joins service to form service-flexibility in product, and the rest joins cost to form cost-flexibility in volume.

Table-2
Results of factor analysis for variable "competitive advantage in operations"

Items	1	2	3	4	5	Factors
Ability to offer different products with large number of characteristics, features, options	.720	-.100	-0.037	0.162	0.106	Factor 1 Service-Flexibility in product
Ability to design product and/or process in function of customer needs and demands	.657	.268	0.100	0.116	0.073	
Ability to offer adequate after-sales service	.656	.238	-0.054	-0.016	0.248	
Ability to introduce quick changes in product creation and design	.632	.124	0.264	0.349	-0.117	
Ability to manufacture range of products easily in same installations	.576	-.071	0.389	0.274	-0.055	
Ability to provide full information	.553	.348	0.232	-0.067	0.289	
Ability to offer defect-free products	-0.01	0.784	0.271	0.238	0.088	Factor 2 Quality
Ability to offer product that meets specifications set in design	0.12	0.767	0.192	0.158	0.101	
Ability to maximise problem-free time of product functioning	0.35	0.669	0.027	-0.069	0.199	
Ability to offer products when consumer wants them	0.067	0.249	0.780	0.131	0.155	Factor 3 Deliveries
Ability to offer products quickly	0.049	0.223	0.772	0.221	0.078	
Ability to facilitate orders and returns	0.455	0.031	0.534	0.001	0.249	
Ability to reduce product cost	-0.117	0.265	-0.053	0.728	0.096	Factor 4 Cost-Flexibility in volume
Ability to operate at different output levels	0.276	0.022	0.171	0.692	0.140	
Speed at which unit can raise capacity after unexpected increase in demand	0.214	0.118	0.219	0.621	0.095	
Ability to adjust mix of products quickly and at minimum cost	0.219	-0.164	0.189	0.407	0.288	
Ability to minimise impact of production activity on environment	0.164	0.158	0.095	0.167	0.830	Factor 5 Environment
Ability to manufacture products that respect environment	0.089	0.201	0.183	0.197	0.819	

The authors used two items to measure the firm performance variable. The items have an underlying dimension labelled performance, which explains 96.05% of the total variance, as table- 3 shows.

Table- 3
Results of factor analysis for variable "performance"

Items	**1**	**2**	**Factors**
Productivity	0.993	0.079	Factor 1 Performance
ROI	0.989	0.119	

The authors analysed the reliability using Cronbach's alpha, to determine the internal consistency of the measurement instrument. The values obtained exceed 0.7, which means that the scales used to measure each of the variables proposed in the analytical model are acceptable[31, 32]. Table- 4 summarises these results. With the unidimensionality and the reliability confirmed, the authors then analysed the content and convergent validity. The content validity indicates that the items considered satisfactorily represent the concepts they are meant to measure. The authors obtained the set of items used ~~(Appendix A)~~ on the basis of a review of the literature. They calculated the convergent validity by measuring the extent to which the different scales used to measure a variable are correlated[31]. The correlations are generally quite high, and all are significant, which confirms that the measures used for each model variable have a good convergent validity.

Table-4
Mean, standard deviation, correlations and reliability of Practices, Competitive advantage, and Performance

Variables	**Mean**	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Reliability**
					Practices					
Capacity	5.27	0.95	.369**	-	-	-	-	-	-	.747
Technology	3.23	1.85	.292**	-	-	-	-	-	-	.734
Vertical integration	4.32	1.28	.383**	.357**	-	-	-	-	-	.722
Quality man.	4.54	1.20	.468**	.416**	.342**	-	-	-	-	.701
Planning	5.29	0.99	.248**	.396**	.409**	.534**	-	-	-	.864
Env. management	5.31	0.92	.450**	.255**	.249**	.515**	.283**	-	-	.811
HRM and Org.	4.87	1.07		.326**	.429**	.575**	.567**	.425**	-	.864
					Comp. advantage					
Quality	5.36	0.90	-	-	-	-	-	-		.751
Deliveries	4.99	0.93	.441**	-	-	-	-	-		.795
Serv. and Flex. Prod.	7.72	1.08	.421**	.444**	-	-	-	-		.784
Environment	4.78	1.19	.402**	.391**	.411**	-	-	-		.806
Cost and Flexibility in Volume	4.64	0.85	.337**	.406**	.354**	.363**	-	-		.769
Performance										
Productivity	169	174	-							.902
ROI	170	168	-.984**							

*Correlation significant at 0.05 level ** Correlation significant at 0.01 level

Results and Discussion

The authors used structural equations to test the proposed hypotheses. This methodology allowed them to statistically validate the model proposed in figure-1, through a simultaneous analysis of the system of variables and relations that defines the model[32].

From the data available, the factor analysis resulted in a set of observable variables, specifically the seven variables measuring the operations practices in the operations strategy, the five variables measuring competitive advantages in operations, and firm performance. These observable variables act as indicators of the three latent variables that represent operations practices, competitive priorities (competitive advantage in operations), and firm performance. The theoretical structure represented in Figure- 1 postulates four hypotheses among the variables "Operations practices", "Competitive advantage in operations" and "Performance".

The structural equation technique requires building two submodels: the structural model and the measurement model. The first describes the causal relations between the latent variables. Figure- 2 illustrates the structural model.

The measurement model represents the relations between the latent variables and their indicators and between the different latent variables. After defining the structural and measurement models, the authors then estimated the theoretical model. They carried out a first-order confirmatory factor analysis through a structural equations system, using the AMOS 5.0 computer software. They used the robust maximum likelihood estimation method, which throws up fewer problems with non-normal data. Figure- 3 reports the different estimations.

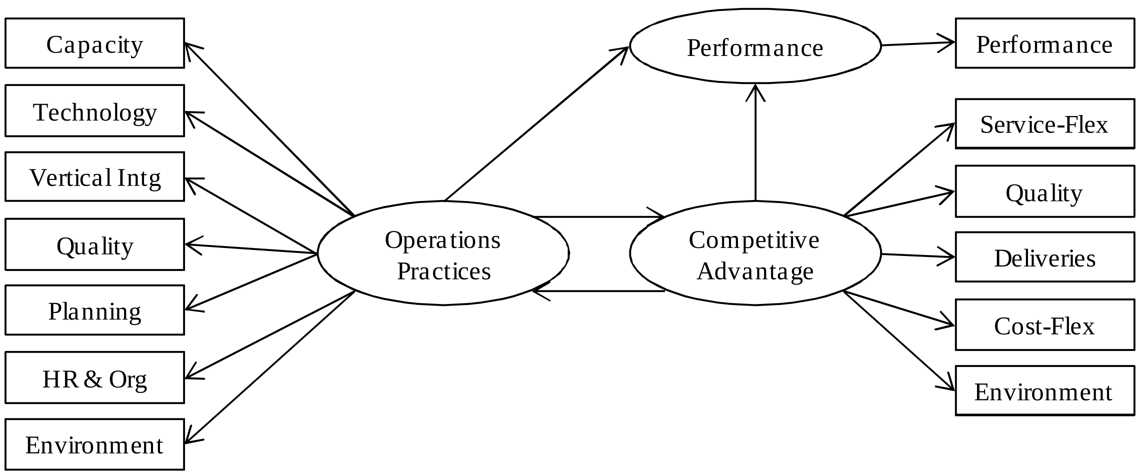

Figure-2
Structural model

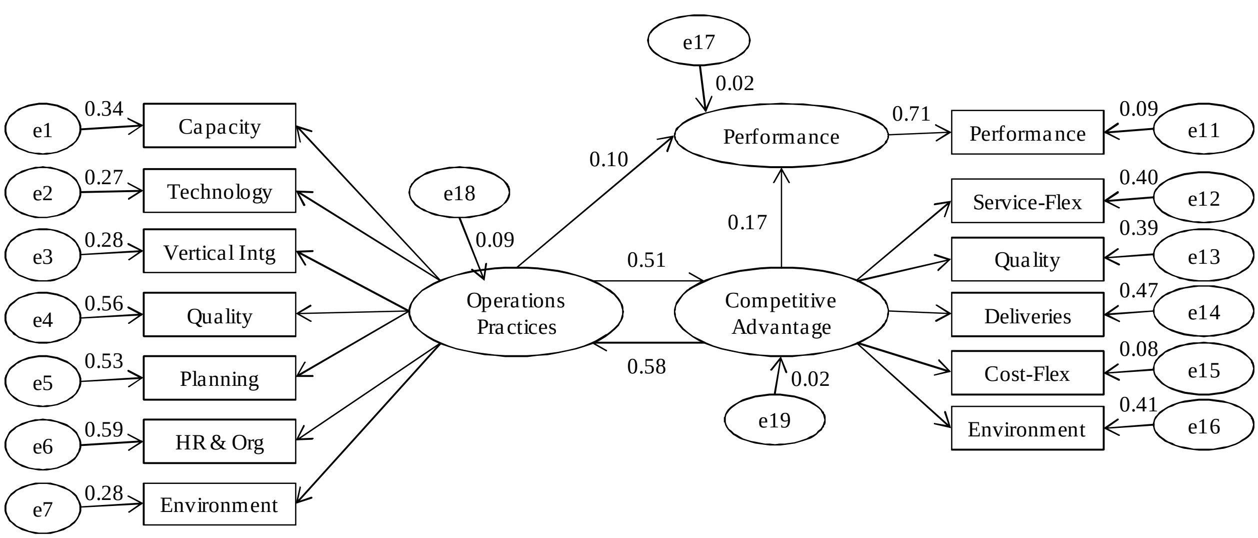

Figure-3
Structural and measurement models

The results show that all the latent variables load significantly on their indicators (significance measured by the t statistic), although the loadings vary in intensity. Table- 5 reports the results of this analysis.

Table-5
Loadings of standardised regression coefficients

			Estimation
Service-flexibility	<---	Competitive advantage	0.635
Quality	<---	Competitive advantage	0.627
Deliveries	<---	Competitive advantage	0.683
Cost-flexibility	<---	Competitive advantage	0.281
Environment	<---	Competitive advantage	0.637
Environment	<---	Practices	0.526
HR-Organisation	<---	Practices	0.765
Prod. planning	<---	Practices	0.728
Quality	<---	Practices	0.751
Vert. integration	<---	Practices	0.529
Technology	<---	Practices	0.522
Capacity	<---	Practices	0.583
Performance	<---	Performance	0.706

Cost-flexibility has the lowest loading, which may suggest that it is not an acceptable indicator for competitive advantage in operations compared to the other capabilities (service-flexibility, quality, deliveries, and environment). All the indicators of operations practices have high loadings, particularly human resources and organisation, quality management, and production planning. This result shows the importance of infrastructural compared to structural practices. The performance dimension loads significantly and highly on the performance variable, which suggests that the right indicators have been used to measure this variable.

The authors then evaluated the model by analysing its global fit, using a number of indices. Two of the most commonly used of these are CFI (comparative fit index) and RMSEA (root mean square error of approximation). CFI should be greater than or equal to 0.9, while RMSEA should be less than 0.05 [32]. The results suggest that the model has a good global fit to the data, since CFI=0.92 and RMSEA=0.012. Table- 6 shows the results of the estimation of the standardised parameters along with the results of the hypothesis tests.

Table-6
Support for hypotheses

Hypothesis	Relation	Direct effect	Support
H1	Prac→CompAd	0.506*	YES
H2	CompAd→Prac	0.778**	YES
H3	Prac→Perf	0.098	NO
H4	CompAd→Perf	0.170*	YES

*Significant at 0.05 level, ** Significant at 0.01 level

Hypothesis 1 postulates that firms that design and implement their operations strategy on the basis of a larger number of structural and infrastructural practices achieve competitive advantages in operations. The standardised coefficient is 0.506 (significant at the 0.05 level), so this hypothesis can be accepted. Thus implementing structural and infrastructural practices has a direct, positive effect on the achievement of competitive advantages in this area with respect to quality, flexibility, deliveries, service, and environmental protection.

Hypothesis 2 postulates that the competitive priorities that firms develop have a direct, positive effect on the design of the most appropriate operations strategy (structural and infrastructural practices). This hypothesis can also be accepted, since the standardised coefficient is 0.778, $\alpha<0.01$). This result means that the capabilities that firms develop in the operations area are critical in the design of the operations strategy in terms of the structural and infrastructural practices that should be selected.

The support provided for these two hypotheses shows the level of strategic fit and internal coherence between the operations practices of the firms examined here and their competitive advantages in operations. This is critical for developing the potential of the production function as a competitive weapon. Moreover, the results show the necessity of the internal fit between the two elements making up the content of the operations strategy (operations practices and competitive priorities). These results are consistent with previous studies [17, 21, 33].

According to Hypothesis 4, firms that manage to develop competitive advantages in operations achieve better performance, and this hypothesis also obtains support (standardised coefficient 0.17, $\alpha<0.05$). Thus firms that have developed competitive priorities, whether in quality, flexibility, deliveries, service, or environment, perform better in terms of productivity and ROI. This is consistent with one of the typical assumptions in the operations area about the relation between competitive advantages in operations and superior firm performance[30,34].

The data do not, however, support Hypothesis 3, so it cannot be said that greater investments in operations practices to design and implement the operations strategy lead to superior performance. Thus the current research has not found a direct relation between the operations practices of the operations strategy and productivity or ROI. One reason for the failure to support this relation could be the existence of other variables not considered here that may also influence the performance measures used. In addition, firm performance is a consequence of the contribution of various functional areas (marketing, human resources, R and D, etc.), not just operations. And indeed previous research has obtained similar results[8,22,26,28].

The proposed model explains how operations practices have a positive relation with the achievement of competitive advantage in operations, and how this latter variable is positively associated with superior performance. Consequently, operations practices have an indirect influence on the achievement of this performance through competitive advantage in operations, but according to the evidence presented here, they do not have a direct effect.

Conclusion

This work has proposed a theoretical model to analyse the causal relations between three fundamental variables in operations management: operations practices, competitive priorities in operations, and firm performance.

As a result of the decisions that the firm adopts, it can create a structure that enables it to acquire a series of capabilities. The capabilities developed in this functional area have a direct effect on the design and formulation of the most appropriate operations strategy, providing the key to developing the potential of the operations area as a competitive weapon. Thus when a company defines its strategic position, it can focus on the competitive priorities for which it has specific capabilities.

The results from the empirical analysis carried out here suggest that the strategy firms design in the operations area has a direct, positive effect on the competitive advantages they achieve in terms of quality, flexibility, deliveries, service, and/or environmental protection, and that the development of these competitive priorities, in turn, has a direct, positive impact on the structural and infrastructural practices that make up the operations strategy. Moreover, both aspects that make up the content of the operations strategy – operations practices and competitive advantages in operations – have a positive effect on the firm’s performance. Nevertheless, the results presented here do not provide support for the direct relation between operations practices and firm performance, only for the indirect relation through competitive advantage in operations.

The absence of a direct effect between operations practices and performance can in part be explained by the fact that this effect transfers to competitive advantage in operations. Moreover, firms obtain superior performance as they develop unique competitive advantages over their competitors, a relation that has gained support in the current research. Thus in general, implementing a large number of structural and infrastructural practices in isolation will not mean a better performance for the firm; these practices must translate into the achievement of competitive advantages in operations over the competitors.

In fact, the relations analysed here have been studied very frequently in the operations management literature, although in the past decade authors have generally analysed each relation separately[10,11,15,17,24,34]. The current work is novel in that it has used structural equations analysis to test the relations jointly.

This paper offers clear theoretical implications. First, the general model proposed and tested here provides theoretical support for relations between key variables from the production and operations area: operations practices, competitive priorities, and firm performance in terms of productivity and ROI. This advances our understanding of the operations strategy and reinforces the potential of the production and operations function. Second, the work provides theoretical and empirical evidence of the degree of fit and coherence that must exist between the structural and infrastructural practices (operations practices) and the competitive priorities – key aspects of the content of the functional operations strategy.

The practical implications of the work are also clear. First, the proposed model should prove to be a useful tool to help production and operations managers evaluate the competitive advantages developed in the operations area when they are designing and formulating an effective strategy based on a series of structural and infrastructural practices. Second, the work shows the potential importance for the firm of achieving certain operations capabilities as a means of improving its performance. This means that top management should consider operations a key, strategic functional area.

Nevertheless, researchers could expand the analytical model proposed here in future work to include other variables to do with the environment and the competitive strategy adopted by the firm, in order to confirm the existence of an external fit between the functional operations strategy and the corporate strategy. At the same time, it would also be useful to analyse whether aspects such as firm size (measured by number of employees), the industrial sector, or the type of production unit considered (firm, plant, factory, or department) have any influence on the proposed model. In the future the questionnaire should, if possible, be sent to more than one manager in each firm to improve the information available. Researchers could also use different performance measures to the ones used here, as well as replicate the model in other sectors of activity.

Appendix-A

Operations practices	
Structural Practices	**Infrastructural practices**
Capacity and Location of installations	**HRM**
Reconfiguration of distribution in plant	**Increase variety of workers' tasks**
Restructuring and reorganisation of factory	Expand workers' responsibilities
Investment in plant, equipment and R and D	Team work
Expand plant capacity	Worker training
Location and relocation of installations	Manager training
Technology	**Quality management and control**
Computer-aided design (CAD)	Total quality management (tqm)
Computer-aided manufacturing (CAM)	Zero-defect programmes
Robots	Quality circles
Numeric-controlled machines	Statistical control of quality
Vertical integration	Preventive maintenance
Subcontraction of part of manufacturing processes	Continuous improvement of processes
Collaboration relations (stable, lasting and based on trust) with suppliers	Iso 9000 certification
Integration of Information Systems with suppliers (exchange of information)	**Production planning and control and inventory management**
	Improve production and inventory control systems
	Reduce machine preparation time
Environmental protection programmes	Reduce production cycle and delivery time
Environmental management systems	Just-in-time purchase management
ISO 14001 certification	**Organisational structure**
	Decentralisation of decisions
	Improve manager-worker relations
	Improve quality of life in work
	Multi-functional teams

Competitive Priorities (Competitive Advantages In Operations)
Cost
Ability to reduce product cost (labour costs, material costs, fixed costs)
Quality
Ability to offer defect-free products
Ability to offer product that meets specifications set in design
Ability to maximise problem-free time of product functioning (lasting and reliable)

Flexibility Flexibility In Volume Speed with which unit can increase capacity after unexpected increase in demand Ability to operate profitably at different output levels (ease of going from large to small batches and vice versa) Flexibility In Product Ability to introduce quick changes in product creation and design Ability to manufacture range of products easily and without modifying existing installations Ability to offer different products with large number of characteristics, features, options... Ability to adjust quickly and with minimum cost mix of products to be produced (ease with which machinery can go from making one type of product to another) **Deliveries** Ability to offer products quickly Ability to offer products when consumer wants Ability to facilitate orders and returns **Service** Ability to offer adequate after-sales service Ability to design product and/or process in function of consumer needs and demands Ability to provide full product information to customer **Environment** Ability to minimise impact of production activity on diverse components of environment Ability to make products that respect environment	
Performance	Productivity, ROI

References

1. Lillis B. and Lane R., Auditing the strategic role of operations, *Int. J. of Management Rev.*, **9(3**), 191–210 **(2007)**

2. Dangayach G.S. and Deshmukh S.G., Manufacturing Strategy. Literature Review and Some Issues, *Int. J. of Operations and Production Management*, **21(7**), 884-932 **(2001)**

3. Skinner W., Manufacturing Missing Link in Corporate Strategy, *Harvard Business Review*, **47**, 136-145 **(1969)**

4. Wheelwright SC, Manufacturing Strategy: Defining the Missing Link, *Strategic Management J.*, **5(1),** 77-91 **(1984)**

5. Hayes R.H. and Wheelwright S.C., *Restoring Our Competitive Edge: Competing through Manufacturing*. New York: John Wiley **(1984)**

6. Buffa E., Meeting the Competitive Challenge, Dow Jones-Irwin: Homewood, IL, **(1984)**

7. Hill T., Teaching manufacturing strategy, *Int. J. of Operations and Production Management*, **6(3)**, 10–20 **(1986)**

8. Ward P. and Duray R., Manufacturing Strategy in Context: Environment, Competitive Strategy and Manufacturing Strategy, *J. of Operations Management*, **18(2)**, 123-138 **(2000)**

9. Oltra M.J. and Flor M.L., The moderating effect of business strategy on the relationship between operations strategy and firms' results, *Int. J. of Operations and Production Management*, **30(5-6)**, 612-638 **(2000)**

10. Narasimhan R., Swink M. and Kim S.W., An exploratory study of manufacturing practice and performance interrelationships. Implications for capability progression, *Int. J. of Operations and Production Management*, **25(10)**, 1013-1033 **(2005)**

11. Swink M., Narasimhan R. and Kim S.W., Manufacturing practices and strategy integration: effects on cost efficiency, flexibility, and market-based performance, *Decision Science,* **36(3),** 427-435 **(2005)**

12. Díaz E., Martín M.L. and García F.E., Structural and infrastructural practices as elements of content operations strategy, *Int. J. of Production Research,* **45(9)**, 2119-2140 **(2007)**

13. Morita M., Flynn E.J. and Ochiai S., Strategic management cycle: The underlying process building aligned linkage among operations practices, *Intl. J. of Production Economics,* **133**, 530-540 **(2011)**

14. White G.P.A, Meta–Analysis Model of Manufacturing Capabilities, *J. of Operations Management*, **14(4),** 315-331 **(1996)**

15. Noble M.A., Manufacturing Competitive Priorities and Productivity: An empirical Study, *Int. Operations and Production Management*, **17(1)**, 85-99 **(1997)**

16. Corbett C. and Claridge G.S., Key Manufacturing Capability Elements and Business Performance, *Int. J. of Production Research,* **40(1),** 109-131 **(2002)**

17. Kathuria R., Partovi F.Y. and Greenhaus J.H., Leadership practices, competitive priorities, and manufacturing group performance, *Int. J. of Operations and Production Management,* **30(9-10)**, 1080-1105 **(2010)**

18. Brown S., Squire B. and Blackmon K., The Contribution of Manufacturing Strategy Involvement and Alignment to World-Class Manufacturing Performance, *Int. J. of Operations and Production Management,* **27(3)**, 282-302 **(2007)**

19. Ketokivi M.A. and Schroeder R., Manufacturing Practices, Strategic Fit and Performance a Routine-based view, *Int. J. of Operations and Production Management,* **24(2),** 171-191 **(2004)**

20. Cua K.O., McKone K.E. and Schroeder R.G., Relationships between implementation of TQM, JIT, and TPM and manufacturing performance, *J. of Operations Management,* **19**, 675-694 **(2001)**

21. Peng D.X., Schroeder R.G. and Shah R., Competitive priorities, plant improvement and innovation capabilities, and operational performance, A test of two forms of fit, *Int. J. of Operations and Production Management,* **31(5)**, 484-510 **(2011)**

22. Kim J.S. and Arnold P., Operationalizing Manufacturing Strategy: An Exploratory Study of Construct and Linkage, *Int. J. of Operations and Production Management,* **16(12)**, 45-73 **(1996)**

23. Swamidass P.M. and Newell W.T., Manufacturing Strategy, Environmental Uncertainty and Performance: A Path Analytical Model, *Management Science,* **33(4)**, 509-524 **(1987)**

24. Avella L., Fernández E. and Vázquez C.J., Análisis de las Estrategias de Fabricación como Factor Explicativo de la Competitividad de la Gran Empresa Industrial Española, *Cuadernos de Economía y Dirección de la Empresa,* **4,** 235-258 **(1999)**

25. Acur N., Gertsen F., Sun H. and Fick J., The formalisation of Manufacturing Strategy and its Influence on the relationship between competitive objectives, improvement goals, and action plans, *Int. J. of Operations and Production Management,* 23**(10),** 1114-1141 **(2003)**

26. Boyer K.K. and McDermott C., Strategic Consensus in Operations Strategy, *J. of Operations Management,* **17(2)**, 289-305 **(1999)**

27. Rho B.H., Park K. and Yu Y.M., An International Comparison of the Effect of Manufacturing Implementation Gap on Business Performance, *Int. J. of Production Economics,* **70**, 89-97 **(2001)**

28. Amoako-Gyampah K. and Acquaah M., Manufacturing Strategy, Competitive Strategy and Firm Performance, *Int. J. of Production Economics* **111,** 575-592 **(2008)**

29. Vickery S.K., Dröge C. and Markland R.E., Dimensions of Manufacturing Strength in the Furniture Industry, *J. of Operations Management,* **15(4)**, 317-330 **(1997)**

30. Brown S., Squire B. and Lewis M., The impact of inclusive and fragmented operations strategy processes on operational performance, *International J. of Production Research,* **48(14)** 4179-4198 **(2010)**

31. Lehmann D.R., Gupta S. and Steckel J.H., *Marketing Research*, New York: Addison-Wesley, New York **(1999)**

32. Bollen K. *Structural Equations with Latent Variables*. New York: John Wiley and Sons **(1989)**

33. Joshi M.P., Kathuria R. and Port S.J., Alignment of Strategic Priorities and Performance: An Integration of Operations and Strategic Management Perspective, *J. of Operations Management,* **21**, 353-369 **(2002)**

34. Demeter, K. Manufacturing Strategy and Competitiveness, *Int. J. of Production Economics* **81-82**, 205-213 **(2003)**