

Analyzing Management Factors on Enterprise Performance

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Abstract

A sample of Italian manufacturing companies was selected in order to verify the abilities and effects (relationships) of the management factors human resources, leadership and strategic planning on company performance. The Partial Least Squares (PLS) estimation method was used for analyzing the data collected, where the relationships between the management factors and performance were formalized by a *Structural Equation Model* (SEM).

The analysis of the survey data showed unexpected result regarding the non significant direct relationship between Leadership and Performance. The effect of Leadership is obtained by an indirect relationship through Human Resources. The combination of Leadership and Human Resources has hence been identified as the management factors which have the highest impact on the performance of Italian industrial companies.

Another interesting and unexpected result was that there was no significant impact of Strategic Planning on Performance. It seems that the leaders of Italian industrial companies have not understood that good strategic planning is a necessary condition for achieving excellence. So another improvement area is in fact Strategic Planning. This area should have the highest priority of any top management team and the focus should include how to establish a strong relationship between strategic planning and performance. No correlation between strategic planning and performance is a strong indication that something is wrong. It is not enough that Leadership is doing Strategic Planning-Leadership is also about studying and follow up on results in order to assure impacts on performance. This link seems to be missing in Italian industrial companies

Key Words: Leadership, Human Resources, Strategic Planning, Performance, Partial Least Squares, Structural Equation Model

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1. Introduction

The aim of this paper is to show the results of a survey that the University Consortium in Engineering for Quality and Innovation, Italy, has led. A sample of Italian manufacturing companies was selected in order to verify the abilities and effects (relationships) of the management factors human resources, leadership and strategic planning on company performance.

The *Partial Least Squares* (PLS) estimation method was used for analyzing the data collected, where the relationships between the management factors and performance were formalized by a *Structural Equation Model* (SEM).

2. The Data Collected and the Model for Evaluating the Management Factors

Data were collected from a sample of Italian manufacturing companies and represents the answers of 120 enterprises. The sample is based on an analysis of the Italian manufacturing structure, with the reference to *D economic section*, of the Italian Statistics Institute *Ateco 2002* classification system. The sector is characterized by mostly small and medium enterprises (93%) and the remaining part by enterprises with more than 100 employees. From an economic point of view the big enterprises cover 50% of the production of the whole sector and employ 40% of the workforce. In order to respect the structure of the Italian manufacturing sector the sample was selected as a weighted random sample where each company were assigned sampling weights according to company size. Based on 120 selected companies, the percentage of the enterprises selected follows the below proportions:

- 42%, with less than 50 employees;
- 14%, between 50 and 100 employees;
- 44%, with more than 100 employees.

To measure the impact of management factors on the enterprises' performances, a questionnaire subdivided into four evaluation areas was used (see Table 1). Questionnaire data related to the 35 statements in table 1 were gathered through telephone interviews with the leaders of the selected companies. Respondents were asked to evaluate each statement on an ordinal scale with variation from 1 (disagree) to 2 (neither disagree nor agree) to 3 (agree). Table 1 shows all the variables used formulated as positive statements (LV means Latent Variables).

A short description of the latent variables may help to make the discussion easy. For *Leadership* the statements (the manifest variables) selected are highlighting the character of the leader, managerial capability in long term planning, orientation towards innovation, increasing the value of own collaborators and having a good relationship with the stakeholders. In the *Human Resource* area the necessity to have employees that are skilful to bring

Table 1. Variables used in the Management Factor Model

LV	MANIFEST VARIABLES	LV	MANIFEST VARIABLES
1. <i>Performance</i>	1. The market share has increased during the last three years.	3. <i>Human Resource</i>	16. The personal's careers are based on specific plans.
	2. The revenue has increased during the last three years.		17. The company has invested in Research & Development
	3. The percentage of Profit has increased		18. Job satisfaction is being evaluated.
	4. The percentage of Return Of Investment has increased during the last three years.		19. Personal skills are being evaluated.
	5. The total trend of the company's performance has improved.		20. People's merits are recognised and rewarded.
2. <i>Leadership</i>	6. Leadership values are well defined.		21. Work groups are used for specific themes
	7. The leadership styles of governance depend on employee characteristics.		22. The employees have decision autonomy.
	8. Management is open when communicating with employees		23. The employees identify themselves with the companies
	9. Management participates in formative events.		24. Middle management has decision autonomy
	10. Management is involved in setting employee rewards		25. Systematic analyses are made for customer expectations and market potentiality
	11. Management evaluates its leadership style compared with other company managers.	26. Performance indexes are used for medium and long term plans.	
	12. Management listen to considerations from employees	27. The strategies consider competitor analysis.	
	13. Management promotes programs for improving the Society and the Environment	28. Medium and long term plans are used for resource allocation.	
	14. Management involves the employees in setting objectives.	29. The strategies are periodically re-evaluated.	
	15. Management has negotiation capacity in critical situations.	30. A structured process defines the objectives and their diffusion.	
		4. <i>Strategic Planning</i>	31. The various operative groups are conformed to the main objectives
			32. Each employee knows his objectives and results
			33. The employees are involved in the definition of objectives.
			34. New planning documents are developed for new projects.
			35. Documents for the annual operative planning are developed

the enterprise towards excellence has been the focus. The statements are about promotions, re-conversions, careers, training, and recognition of improvements. *Strategic Planning* may be the backbone for excellence. The focus is to measure and analyse if managers jointly work with all members of the enterprise through planning, doing and follow up activities driven by management, using systematic methodologies to support and evaluate decisions taken. *Performance* is the objective measure of company health where statements about market

share and economic indexes such as Return of Investment or profit level measure the efficiency of the company.

3. Questionnaire Evaluation

The first step before the analysis of the model has been transforming the data from an ordinal scale to a quasi-cardinal scale, in order to improve the mathematical properties of the scale. The method used is the Thorgerson method, based on the Thurstone approach (Zanella, 2001). The main idea is that each interviewee's criterion of choice follows a latent variable with a normal distribution. In this way it is possible to transform the original ordinal scale to a scale that has a metric which follows a normal distribution.

The transformation approach can be explained by the following three simple steps:

1. For each modality, of each variable X_j , the number of respondents (absolute frequency) is calculated. In this case there are 3 modalities (1, 2, 3) and 35 variables;
2. The cumulative relative frequencies is calculated, representing the estimation of the cumulative density function $F_j(i)$, of the normal distribution,;
3. The $\Phi^{-1}[F_j(i)]$ represents the inverse function of the normal standard distribution to compute quantile τ_j of the function.

After the transformation of the original data two main analyses are developed to evaluate the quality of the questionnaire: A factorial analysis for the unidimensionality to select the relevant manifest variables, and an internal coherence study using Cronbach's Alfa index.

Based on the results of the principal component analysis some variables have been deleted because they were not relevant on the formation of the latent variables.

Table 2, then, reports only the manifest variables selected. The two main factors were chosen by considering the scree test method, and as seen from Table 2, the factors support the following theoretical construct: the first axis represents the *Management Factors*, the second one, represent *Performance*.

By considering only the manifest variables selected, an analysis of internal coherence has been conducted to evaluate the degree of reliability of each latent variable (to express the theoretical concept they are used to measure).

Table 3 reports the values of Cronbach's Alfa index for each latent variable. The values are almost equal to 0.7 (= the target value) for 'Performance' and 'Leadership', whereas for 'Human Resource' and 'Strategic Planning' Cronbach's Alfa is higher than 0.8. From this analysis it is concluded that the reliability of the measure of the latent variables is satisfactory.

Table 2. Principal components Loadings

LATENT VARIABLES	MANIFEST VARIABLES LABELS	F1	F2
<i>Performance</i>	<i>Var. 1</i>	0,119	0,809
	<i>Var. 2</i>	0,141	0,895
	<i>Var. 4</i>	0,054	0,818
	<i>Var. 5</i>	0,153	0,744
<i>Leadership</i>	<i>Var. 12</i>	0,569	-0,007
	<i>Var. 13</i>	0,553	0,074
	<i>Var. 14</i>	0,522	-0,146
<i>Human Resource Management</i>	<i>Var. 16</i>	0,636	0,003
	<i>Var. 18</i>	0,582	-0,044
	<i>Var. 19</i>	0,558	0,048
	<i>Var. 20</i>	0,484	0,094
	<i>Var. 21</i>	0,538	0,168
<i>Strategic Planning</i>	<i>Var. 26</i>	0,602	-0,027
	<i>Var. 28</i>	0,615	-0,088
	<i>Var. 29</i>	0,592	-0,006
	<i>Var. 30</i>	0,627	-0,086
	<i>Var. 32</i>	0,509	-0,103
	<i>Var. 33</i>	0,636	0,003
	<i>Var. 34</i>	0,728	-0,237
	<i>Var. 35</i>	0,604	-0,214

Table 3. Internal Coherence and manifest variables selected

LATENT VARIABLES	CRONBACH'S ALFA	MANIFEST VARIABLES
<i>Performance</i>	0.680	1. The market share has increased during the last three years.
		2. The revenue has increased during the last three years.
		4. The percentage of Return Of Investment has increased during the last three years.
		5. The total trend of the company's performance has improved.
		12. Management listen to considerations from employees
<i>Leadership</i>	0.680	13. Management promotes programs for improving the Society and the Environment
		14. Management involves the employees in setting objectives.
		16. The personnel's careers are based on specific plans.
<i>Human Resource Management</i>	0.807	18. Job satisfaction is being evaluated.
		19. Personal skill is being evaluated.
		20. The merits are recognised and rewarded.
		21. Work groups are used for specific themes
		26. Performance indexes are used for medium and long term plans.
<i>Strategic Planning</i>	0.853	28. Medium and long term plans are used for resource allocation.
		29. The strategies are periodically re-evaluated.
		30. A structured process defines the objectives and their diffusion.
		32. Each employee knows his objectives and the results
		33. The employees are involved in the definition of objective resources.
		34. New planning documents are developed for new projects.
		35. Documents for the annual operative planning are developed

4. Estimation and Analysis of the Management Factor Model

The Management Factor Model is shown as a path diagram in Figure 1. The model considers as dependent variables (endogenous variables) “Performance”, “Human Resources”, and “Strategic Planning” and as independent variable (exogenous variable) “Leadership”.

The path diagram is a suitable method for a graphic representation of the relationships among the variables. In the graph, the *latent variables* (constructs) are indicated by using the Greek letters (ξ_i) and are shown by circles; The *manifest variables* (items) are indicated by Latin letters (X_i) and shown by rectangles.

The arrows between the latent variables represent the causal relationships also called the structural model, and the arrows between the manifest and the latent variables, represent the measurement relationships also called the measurement model.

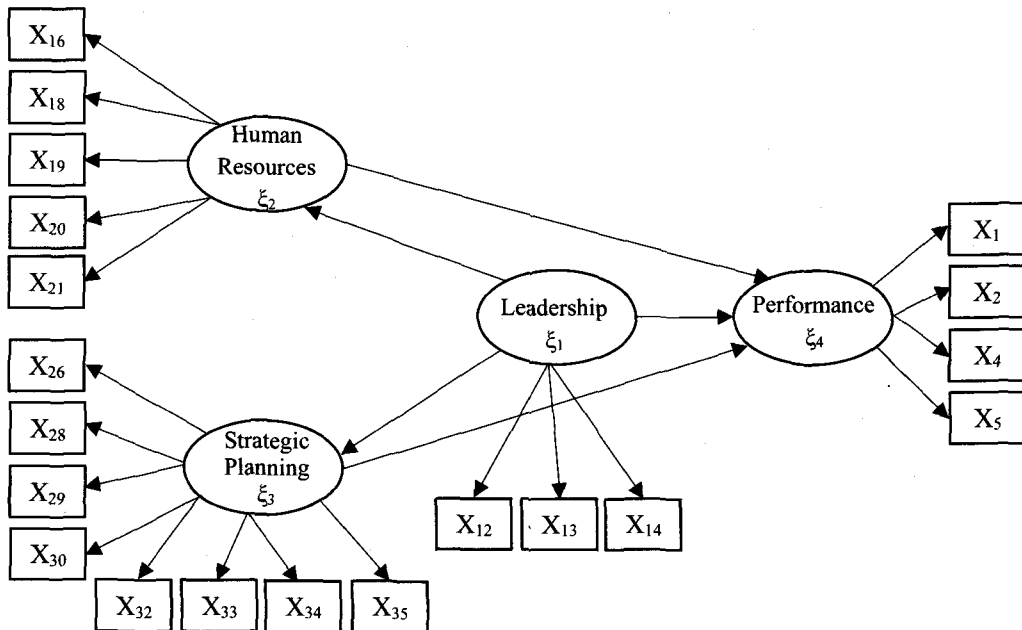


Figure 1. The Management Factor Model

The PLS method (*Partial Least Squares*) was used for estimating the relationships between the latent variables (path coefficients or impact scores) and the significance. The advantage of using PLS is that there is no distribution assumption on the error term. Figure 2 shows the *Path Diagrams* with the results of the PLS estimation method.

Figure 2 shows the estimated coefficients, where the significant relationships have been highlighted by bold lines and non significant relationships are shown by broken lines. The numbers in brackets are the significance values of the bootstrap t-statistics (bootstrap re-sam-

pling, considering 100 samples of dimension 120).

The estimated coefficients suggest that *Human Resource* is the only variable having a significant and positive direct impact on *Performance*. The variables *Leadership* and *Strategic Planning* have no significant direct impact on *Performance*, but the impact of *Leadership* on *Human Resources* and *Strategic Planning* are significant. Table 4 reports the values of the latent variables (Mean Score) obtained as a weighted average score of the manifest variables using estimated weights.

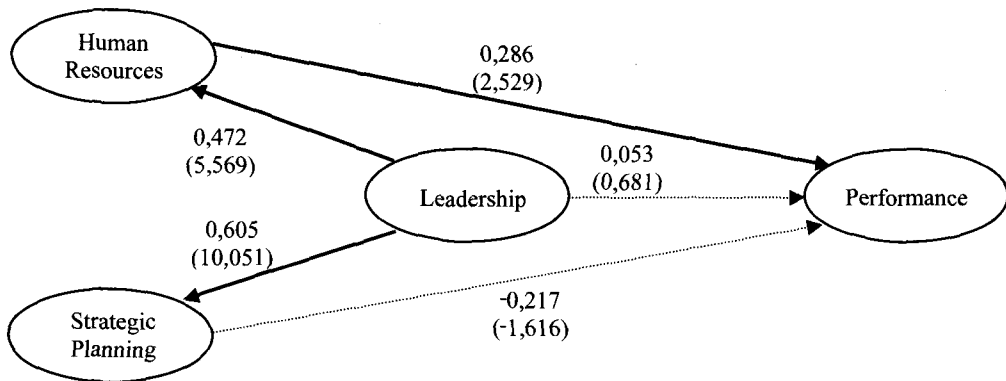


Figure 2. Results of the PLS estimation

Table 4. Estimated Values of the Latent Variables

L.V.	Performance	Leadership	Human Resource	St. Planning
Values	2,497	2,751	2,470	2,643

The exogenous latent variables were categorized into two groups of agreement level. The variables in the first group have a relatively high level of agreement with the positive statements, and the variables in the second group have a relatively low level of agreement. The level of agreement is recognised as relatively high when the agreement value is 2.50 or higher and relatively low when the level of agreement is below 2.50. By using this categorization it is possible to construct an interventions matrix by combining the information of the path coefficients and the average agreement reached as reported in the following Table 5.

Table 5. Interventions Matrix

		Agreement	
		Low	High
Importance	Low		Strategic Planning
	High	Human Resource	Leadership

The “message” of the interventions matrix is that improvements should be prioritised to variables where importance is relatively high and agreement relatively low. Hence the general message of Table 5 is that Italian industrial companies are relatively weak on *Human Resources* and they should first of all improve the *Human Resource* aspects. This message is based on the fact that *Human Resources* were the only variable with a significant impact on *Performance*, and the level of agreement reached was smaller than for the other management factors of the model.

The following Table 6 shows the weights for each manifest variable. The weights show

Table 6. Average Scores of the Latent Variables and weights of the Manifest Variables

LATENT VARIABLES	LV Score	MANIFEST VARIABLES	Weights	T-Test
Performance	2,497	1. The market share has increased during the last three years.	0,163	1,609
		2. The revenue has increased during the last three years.	0,437	3,654
		4. The percentage of Return Of Investment has increased during the last three years.	0,303	2,220
		5 The total trend of the company's performance has improved.	0,280	2,366
Leadership	2,751	12. Management listen to considerations from employees	0,462	10,366
		13. Management promotes programs for improving the Society and the Environment	0,429	6,839
		14. Management involves the employees in setting objectives.	0,422	5,934
Human Resource	2,470	16. The personnel's careers are based on specific plans.	0,325	5,348
		18. Job satisfaction is being evaluated.	0,287	4,360
		19. Personal skill is being evaluated.	0,295	4,522
		20. The merits are recognised and rewarded.	0,323	5,613
		21. Work groups are used for specific themes	0,274	3,113
Strategic Planning	2,643	26. Performance indexes are used for medium and long term plans.	0,169	4,344
		28. Medium and long term plans are used for resource allocation.	0,172	4,936
		29. The strategies are periodically re-evaluated.	0,184	3,780
		30. A structured process defines the objectives and their diffusion.	0,186	4,511
		32. Each employee knows his objectives and the results	0,252	5,967
		33. The employees are involved in the definition of objective resources.	0,223	4,185
		34. New planning documents are developed for new projects.	0,207	6,850
		35. Documents for the annual operative planning are developed	0,148	3,761

how “important” the manifest variables were when calculating the score of the latent variables (LV). For example when looking at Performance we see that the weight of the manifest variable 2 (revenue has increased) was 0.437 which is almost 3 times higher than the weight of the manifest variable 1 (market share has increased).

A strategy for improving the score of the latent variables is to select and improve the manifest variables with the lowest weights. The assumption behind this strategy is that the weights are indicators of the performance (strength or weakness) of the manifest variables. The lower the weight the lower is the strength of the variable.

5. Reflecting and Concluding Remarks

This paper has focused on a study of the relationships between *Leadership*, *Human Resources* and *Strategic Planning*, and the impact of these latent variables on *Performance*. The data analysed were collected by telephone interviews with leaders from 120 Italian industrial companies.

The analysis of the survey data showed a very interesting and unexpected result regarding the non significant relationship between Leadership and Performance. What does that mean? Doesn't good Leadership influence enterprises' performance?

The answer to this question is that even if there is no direct relationship between the two variables, the effect of Leadership is obtained by an indirect relationship through Human Resources. The *combination* of Leadership and Human Resources has hence been identified as the management factors which have the highest impact on the performance of Italian industrial companies. This result is totally in accordance with the findings and suggestions by Dahlgaard and Dahlgaard (2003, 2007) and Martensen *et al.* (2007) in their “4P” model for business Excellence. The message from this model is that a general strategy for improving performance is to improve “the 4P” – People, Partnerships, Processes, and Products – in this order. And because the foundation of “the 4P” is Leadership improvements always starts with Leadership. Without Leadership no sustainable improvements and improvements of “the 4P” go through Leadership. The statistical analyses shown in this paper support this strategy.

Another interesting and unexpected result was that there was no significant impact of Strategic Planning on Performance. It seems that the leaders of Italian industrial companies have not understood that good strategic planning is a necessary condition for achieving excellence. It seems that they have not understood what excellent companies have learned during the last decades that good strategic planning with effective policy deployment is *the backbone* of Total Quality Management and Business Excellence.

So another improvement area, which was not highlighted by the interventions matrix, is in fact Strategic Planning. This area should have the highest priority of any top management

team and the focus should include how to establish a strong relationship between strategic planning and performance. If statistical data analyses, as shown in this report, show no correlations between strategic planning and performance, then we have a strong indication that something is wrong. It is not enough that Leadership is doing Strategic Planning-Leadership is also about studying and follow up on results in order to assure impacts on performance. This link seems to be missing in Italian industrial companies (as indicated in Figure 2).

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