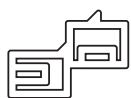


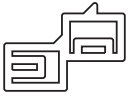
The Impact of Organisation Climate Factors on Efficiency

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Wyndham Consulting Group
(In conjunction with Dr. J. Hirschberg,
Melbourne University and Frontier Economics)



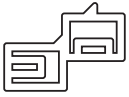
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Organisations put considerable effort and resources into improving workplace relations and staff well-being. In order to monitor the effectiveness of these efforts, surveys of organisation climates have been undertaken in recent years by an increasing number of organisations in a range of industry sectors which includes finance and banking, retail, insurance, transport and the public sector. Surveys are designed to gauge staff opinion on the quality of their working environment. These surveys seek staff views on different dimensions of the working climate. In this report, these factors are collectively referred to as the Climate of organisations. In particular the report investigates the relationships between the Organisation Climate Questionnaire (also known as the Employee Attitude Survey) dimensions and economic performance of organisations.

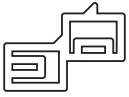
The purpose of this report is to determine whether improvements in climate are potentially translated into improvements in organisation performance. To do this, sophisticated but commonly used modelling techniques have been used to measure economic performance across a range of business operations and to determine which of the climate factors are significantly related to the level of economic performance. This information can then be used to determine:

- if climate has bearing on overall performance;
- which climate factors have a greater or lesser affect on economic performance;
- the areas where improvements in climate will result in greatest performance improvement; and
- the gains that could be expected from improving organisation climate.

This pilot study has been conducted on 87 business units within a corporation across its Australian operations using data from the year August 1994 to July 1995. This data incorporated economic performance and organisation climate data within this time frame.

The remainder of the report is structured into the following sections:

- Section 2 of the report describes what is meant by the economic performance and how it can be accurately measured;
- Section 3 provides a full description of the climate survey, including the aspects of the working environment that are considered in the following analysis, the format of the surveys and their interpretation;
- Section 4 explains the techniques that have been used to examine the relationship between organisation climate factors and economic performance and identifies which of the climate factors are statistically related to economic performance.



In this Section, a clear explanation is given of what is meant by economic performance, why it is important to measure economic performance, and the ways in which economic performance can be measured.

02.1 What is economic performance?

Measures of economic performance focus on the amount of output produced by organisations relative to the amount of inputs used. This is different from financial performance measures that look at profitability or rates of return. Therefore, overall productivity is measured as:

$$\text{Overall Productivity} = \frac{\text{All outputs}}{\text{All inputs}}$$

Performance improvements are shown as an increase in the ratio of outputs produced to the quantity of inputs used. Broadly, performance can be improved by using fewer inputs for the same level of output or producing more outputs with the same quantity of inputs.

Organisations use a variety of inputs such as labour, materials, equipment and vehicles to produce a variety of outputs (i.e. products and services). It is more difficult to create single measures of input and output quantity that capture and properly sum together these very different inputs and outputs. Therefore, partial productivity measures have historically been used to measure the relationship between one input and one output (e.g. shrinkage per \$ sales). For example, labour productivity measures are commonly used that are measured as:

$$\text{Labour Productivity} = \frac{\text{Sales}}{\text{Hours worked (or number of employees)}}$$

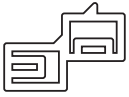
While these ratios are easily calculated, they do not provide a very good indication of the overall performance of the organisation because they only look at the relationship between one input and output at a time. Thus, these ratios only give a partial measure of performance. For example, an organisation may significantly reduce its employees thereby improving its labour productivity performance but at the same time over-invest in capital equipment to compensate, which may worsen overall economic performance.

Therefore, it is difficult to interpret what partial ratios mean for an organisation's efficiency because they only reflect one aspect of an organisation's activities, and it is difficult to make comparisons between organisations based on partial productivity measures. Some organisations will appear efficient in one indicator, but perform poorly in another.

Fortunately, techniques have been developed in applied economic analysis that sensibly aggregate the multiple inputs used and outputs produced by organisations into single measures of input and output quantity. The main approaches are:

- simple indices that combine inputs using simple rules to allow the aggregation of diverse inputs into a single measure (e.g. use the share of total expenditure for each major input as a weight used to add all inputs together); and
- more sophisticated techniques such as statistical or mathematical models to calculate a single measure of performance (which is applied in this study).

In general, the quality of management information improves with the level of sophistication of the measurement technique. However, it becomes progressively more difficult to explain these more sophisticated but more useful performance measures. Clearly the ability to understand sources of inefficiency and improve economic performance provides organisations a competitive edge and some time should be spent understanding the benefits of the approach developed in this study.



For this study we have used the same performance technique favoured by most governments and regulators in Australia. It is a technique that was originally developed for the financial and social services sectors where there are substantial difficulties in forming an overall measure of economic performance because of the large number and highly diverse services and outputs provided.

The technique is known as Data Envelopment Analysis or DEA. As the name suggests DEA establishes the performance envelope or frontier. DEA is widely regarded as the most comprehensive technique for measuring economic efficiency. DEA takes together information on the observed inputs and outputs to create a single measure of performance and then compares the performance of each organisation to every other organisation in the database.

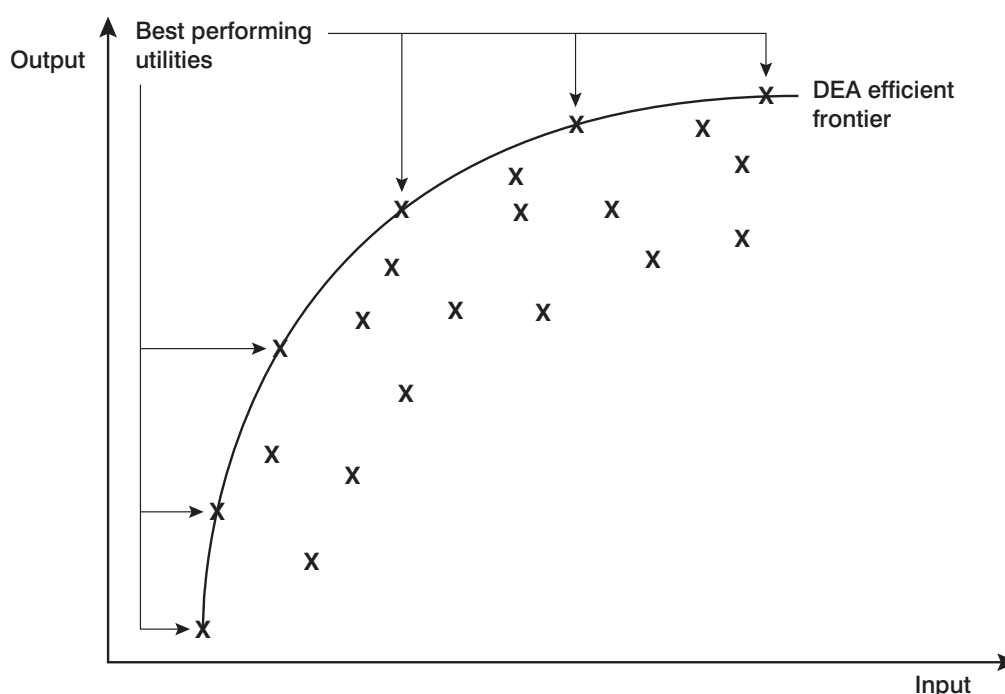
A highly stylised example of the process used by DEA to measure and compare performance is shown in Figure 1.

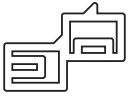
The organisations on the frontier are those that are most efficient, i.e. they use the minimum quantity of inputs to produce the same quantity of outputs as other similar organisations.

DEA compares the efficiency of any organisation by measuring how far it lies from the efficient frontier. The extent of inefficiency is measured as an efficiency score that relates the quantity and costs of inputs used to the quantity of outputs produced. A DEA score of 100% shows that an organisation is using the minimal quantity of inputs to provide the same outputs as similar organisations. More than one organisation can have a score of 100%. **That means that DEA is a technique that explicitly recognises that there are several ways of providing the same services efficiently.**

A DEA score of 80% shows that a business unit would have to reduce their use of resources by 20% to achieve the same level of performance as the best performing units. Another way of thinking about this result is that 20% more output could be produced without using any more resources if that organisation was as effective as the best performing business unit.

Figure 1. DEA frontier





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02.2

Performance measurement (continued)

DEA is able to show the magnitude of an organisation's inefficiency when compared to the best performing organisations in their industry. However, DEA can provide considerably more useful management information. In particular, it can also be used to determine the source of organisational inefficiency, for example, whether inefficiency is due to:

- using too many inputs;
- using the wrong mix of inputs (called allocative inefficiency);
- the size of the organisation (scale inefficiency); or
- environmental factors that are beyond management control (such as the organisation's location).

DEA has been used to measure and compare efficiency in a very wide range of industries. As in this report, where DEA has been used to compare the efficiency of a number of business units, many other companies are using DEA to compare the performance of their outlets include Pizza Hut, Citibank and British Airways.

When measuring efficiency using DEA, a crucial step in the process is defining an organisation's production relationship, i.e., what inputs are used and what outputs are produced. Inputs and outputs used in the DEA model must be quantifiable, consistent across the organisation, and must relate to the objectives of the organisation.

The DEA model used to measure the efficiency of business units, including inputs, include:

- number of employees;
- waste;
- unknown waste;
- total remuneration;
- total operating expenses; and
- rent.

Output is defined as total sales.

03

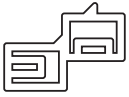
Climate

The survey is in the form of a questionnaire which is completed by all non-management and management staff. The aim of the survey is to identify the impressions and perceptions that staff hold about the quality of their working environment.

The survey gathers information on 11 topics. The survey questions are in the form of a statement, and in their response to the questions staff indicate how true or false they consider the statement to be. Staff are given a choice of four responses: true; inclined to be true; inclined to be false; and false.

The topics or dimensions which staff views are sought on include:

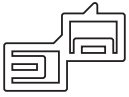
- Communication – flow of information to staff
- Formal control – rules, regulations, policies, procedures and management style
- Goal clarity – role in the organisation and team
- Performance and productivity – perception about standards of performance
- Initiative – level of work freedom and responsiveness to staff input
- Recognition – regard for and appreciation of work effort
- Working relationships – social cohesion among staff
- Team identification – the organisation's emphasis on teamwork
- Customer service – effectiveness of customer service efforts and infrastructure
- Development opportunity – personal development opportunities & equity in opportunity
- Leadership – whether management establishes direction and fosters change



04 Relating performance and climate

04.1 Analytical Approach

- The objective of the modelling was to determine the impact of the managerial climate factors on the efficiency of a business unit by accounting for all the climate factors as well as other business unit characteristics such as floor area and waste. The DEA model included the following inputs – number of employees, floor area, waste, unknown waste, total remuneration and total business unit expenses. A single output was defined as total sales.
- A total of 87 units were examined using data from the year August 1994 to July 1995. Separate DEA scores were calculated for the period August 94 to January 1995 and February to July 1995. It was found that the data available for the first period was more reliable for the purposes of the study.
- Raw technical efficiency scores for business units were produced, as well as average scores through a process known as boot strapping. Boot strapping is done to ensure that there is no single business unit or group of business units that are dominating and/or skewing the results. The median DEA scores for the business units in the study are presented in Appendix 1.
- Measurements of the climate factors obtained from the surveys have been regressed against the DEA efficiency scores calculated for each business unit. As DEA scores are a limited dependent variable (because they lie between 0 and 1), a special regression technique known as Tobit analysis has been used. From this analysis, it was possible to determine which of the climate characteristics had the greatest impact on business unit efficiency and whether the impact on efficiency was positive or negative.
- This statistical procedure results in a predicted DEA score that can be used to determine whether the organisation is doing better or worse than would be expected given its climate. If the predicted score is above the observed or raw score, then the business is performing worse than would be expected, given its climate. Conversely, where an adjusted score is below the actual score then a business unit is doing better than expected, given the constraints imposed by its climate.
- The DEA efficiency scores were then adjusted to account for the climate factors and some other characteristics including: total size, average remuneration per employee and number of employees. This resulted in a **predicted efficiency score** for a business unit based on its characteristics and the effect those characteristics has on its efficiency.



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04.2

Findings

1. From this analysis, it was possible to determine which of the climate characteristics had the greatest impact on business unit efficiency. The climate characteristics that were found to have the highest impact on efficiency in order of significance are:

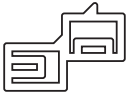
- Communication;
- Goal Clarity;
- Working Relationships; and
- Customer Service.

2. Utilising the current analysis and available data, the remaining climate dimensions do not appear to be as directly related to the efficiency scores, if we consider the probability of making a mistake in these conclusions. This does not mean that they are unrelated, only that the available information does not reveal sufficiently significant relationships for us to be certain of the relationship.

3. A further finding of the analysis was the confirmation that the climate factors are not independent of one another. (This fact has also been revealed in studies conducted on the data base by Dr. Richard Bell of Melbourne University.) This finding is particularly pertinent as the analysis initially suggests that there is a negative correlation between Goal Clarity, Customer Service and the efficiency scores for organisations. This in fact would be the case if the relationships between these factors and all other climate factors were excluded. However, the correlations between the four most significant factors are evident (see Appendix 4) and indicate that they need to be considered as a whole in estimating their impact on the efficiency scores. For example, business units with high scores for Communication also score well in Goal Clarity and even though one has a negative correlation coefficient and the other a positive, the cases of high Goal Clarity and low Communication scores are not common.

In short there is an overall relationship between the set of all factor scores for an organisation. The relative efficiency requires determination of the net relationship between that part of the efficiency score that is influenced by the **managerial climate factors** and that part over which there is no control.

The following Table 1 illustrates the proportional impact of a business unit's managerial climate on its efficiency score. The examples listed are those where there is a probability of 0.9 or greater that the managerial climate factors have had an impact on business unit efficiency. The results reveal both negative and positive impact indicated in the % of Efficiency due to MCF column.



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04.2

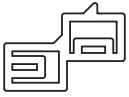
Findings (continued)

Table 1. The percentage of the Total Relative Efficiency that is Attributable to the Managerial Climate Factors.

From Table 1 we can see that the business unit that has the largest percentage of the relative efficiency score that is influenced by the Organisation Climate is 1 where we predict that the median efficiency score would be almost 24% higher if the climate factors measured were equal to the mean, (zero is the mean value of the climate factors). Again the values in this table should be used with caution because they are estimates. In the positive direction we find that Unit 26's median relative efficiency is predicted to be 16% lower if the Organisation Climate factors for this unit were all equal to the mean. Note the average % influence on the relative efficiency of climate factors is zero by definition, thus this method only flags those business units that are significantly different from the average as determined by the coefficients that we have estimated. Thus if a business unit scores the average for all the climate factors except for a high score for Performance/Productivity the coefficient for this factor is very low and it has a very low probability that it is different from zero. Consequently in this case we would predict that the percentage of the relative efficiency that is affected by climate factors is essentially equal to zero. Appendix 3 lists the values for all the Organisation Climate factors for the business units listed in Table 1. From this list one can see that the units with the highest and lowest predicted influences of the climate factors are those that have factor measures that are more than one standard deviation away from the mean (absolute values that are greater than one).

Table 1

Business unit	% of Eff due to Organisation Climate
1	-23.87
2	-12.61
3	-11.95
4	-10.72
5	-9.35
6	-9.25
7	-8.73
8	-7.49
9	-6.31
10	-5.87
11	-4.84
12	5.00
13	5.92
14	6.06
15	6.29
16	7.37
17	7.52
18	7.73
19	7.76
20	8.39
21	8.48
22	9.39
23	10.38
24	11.97
25	12.12
26	16.01



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Appendices

05.1

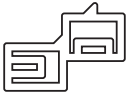
Appendix 1. The Predictions of Managerial Climate Influences on the Median Relative Efficiency Scores.

To provide a business unit specific impact of the managerial climate factors (MCF) we have estimated the percentage of the predicted efficiency score from the model listed in Table A.1 that can be attributed to the factors listed below.

- Communication
- Formal Control
- Goal Clarity
- Performance/Productivity
- Initiative
- Recognition
- Working Relationships
- Team Identification
- Customer Service
- Development Opportunity

These values are computed by determining the total effect of the Organisation Climate factors on the total efficiency score predicted and dividing by the predicted value of the efficiency score.

The result is listed in Table 2 along with the significance level for each computation. Also listed in Table 2 are the standardised values (mean equal to zero and standard deviation equal to one) for these factors as well as the average remuneration, the business unit population and the business unit expenses for each of the business units listed. Note only those business units where the percentage of the total relative efficiency affected by the Organisation Climate factors is significantly different from zero at the 10% level are listed in this table.



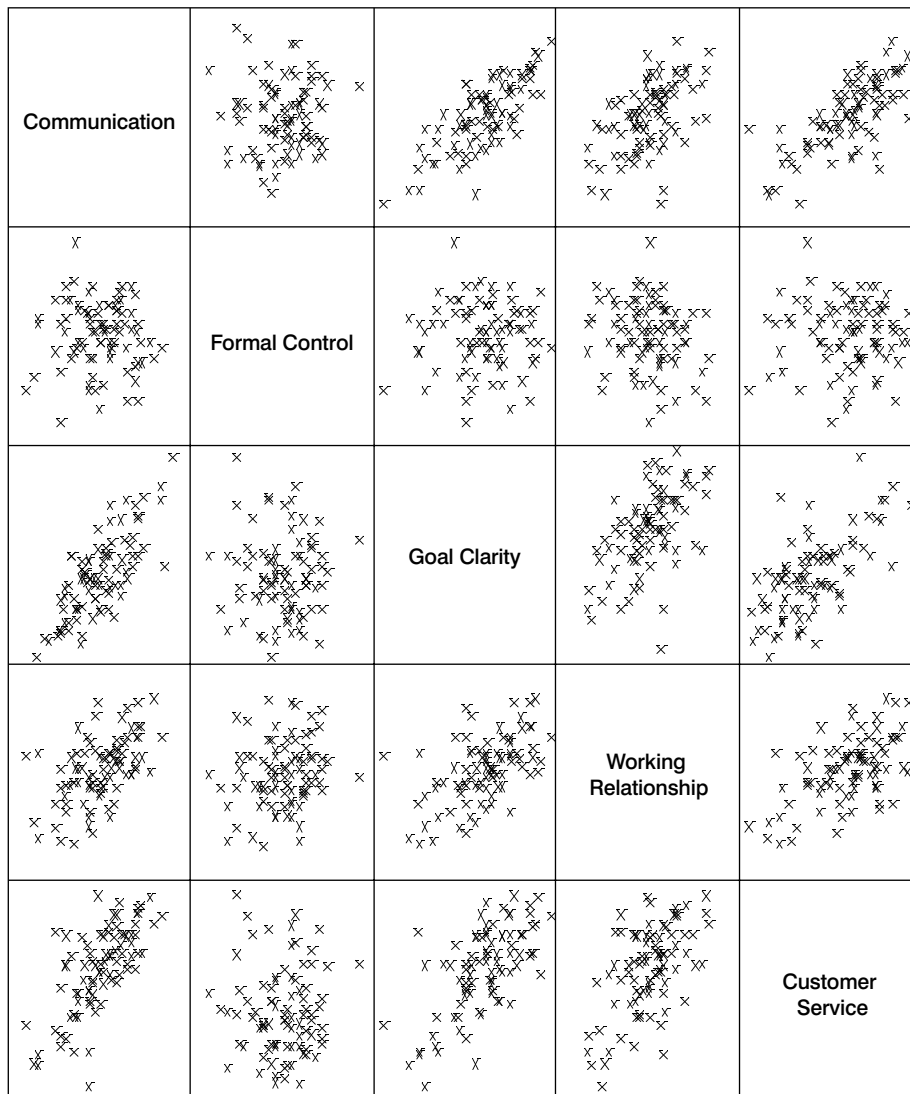
The Impact of Organisation Climate Factors on Efficiency

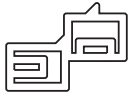
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Appendix 2. The interrelationships between the MFCs, Communication, Formal Control, Working Relationships, Goal Clarity and Customer Service.

Note that the various managerial control factors are not independent of each other. The plot given below shows how these relationships are computed for the most significant Organisation Climate factors from the regression coefficients given in Table 1. The scatter plot where the factor is on the vertical axis is either to the left or right of the title and the scatter plot where the factor is on the horizontal axis is given either above or below the factor label. Note that both Goal Clarity and Customer Service are positively related to the Communications and Working Relationships factors. While the Formal Control factor does not seem to be related to either of the factors with negative marginal effects.





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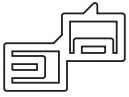
05.3

Appendix 3. Table 2. The % of efficiency score due to Organisation Climate Factors.

TABLE 2

Business unit	% of Eff due to Organisation Climate	Sig Level	Comm-unication	Formal Control	Goal Clarity	Perform/Product	Initiative	Recog-nition	Work Relations	Team ID	Cust Service	Dev Oppor	Avg Rem	Population	Business unit Exp
1	-23.87	**	-2.18	-1.14	-0.23	-2.16	-2.02	-1.47	-1.40	-1.42	-2.18	-2.34	1.81	-0.55	0.20
2	-12.61	**	0.11	-1.41	0.53	0.42	0.83	1.10	-0.40	0.62	0.75	0.34	-0.55	-0.28	0.07
3	-11.95	***	-0.55	-0.35	0.24	-0.87	0.04	-0.71	-0.87	-0.88	-0.25	-0.81	-0.02	-0.26	-0.08
4	-10.72	*	-1.27	-2.46	-0.46	-0.03	1.04	0.34	0.07	0.03	-0.43	-0.68	-0.23	-0.62	-0.32
5	-9.35	*	-1.09	0.97	-0.87	0.68	-0.88	-0.77	-1.13	0.03	0.07	-0.62	0.06	0.30	-0.42
6	-9.25	**	-0.25	0.04	0.35	-0.29	-0.24	-1.47	-0.07	-0.02	0.19	-0.49	-0.32	-0.53	-0.59
7	-8.73	**	-0.37	-1.41	0.30	-0.10	-0.03	-0.30	-0.13	0.08	-0.49	-0.23	-0.05	-0.93	-0.93
8	-7.49	**	-0.61	-0.22	-0.17	0.10	-0.31	-0.65	0.13	-0.99	0.69	0.02	1.33	-0.71	-0.26
9	-6.31	**	0.05	-0.22	0.06	-0.48	0.40	-0.13	-0.47	-0.51	0.81	-0.04	0.46	-0.91	-0.80
10	-5.87	*	0.23	0.18	0.99	-0.29	-0.10	0.05	0.33	1.00	0.32	-0.04	-0.31	0.98	0.78
11	-4.84	*	-0.31	0.44	0.41	-0.03	-1.38	-0.89	-0.40	-0.13	-0.74	-0.94	-0.52	2.99	2.46
12	5.00	**	1.20	0.04	0.76	0.81	1.04	1.28	1.00	1.27	1.31	1.23	0.38	-1.18	-1.24
13	5.92	**	1.08	0.18	1.11	1.52	0.76	1.39	1.20	0.84	0.81	0.60	-0.64	-0.26	-0.32
14	6.06	**	1.08	1.36	0.24	0.10	-0.45	0.17	-0.07	0.30	0.63	0.79	0.59	-0.24	-0.17
15	6.29	*	-0.67	0.70	-1.28	0.16	-2.16	-0.83	-0.27	-0.78	-1.12	-1.51	1.03	-0.62	0.20
16	7.37	**	1.26	0.31	1.34	1.06	0.61	1.51	1.27	1.11	0.38	0.28	0.47	-0.60	-0.70
17	7.52	*	-0.13	0.04	-0.11	-1.32	0.04	0.11	0.60	-0.24	-0.99	1.04	-1.06	0.60	0.17
18	7.73	**	1.14	-0.88	0.47	-0.42	0.12	0.81	0.40	-0.24	0.00	0.72	-1.24	0.03	-0.56
19	7.76	*	0.78	0.57	1.05	1.00	0.68	2.56	1.53	1.43	0.81	0.60	0.10	-0.26	0.15
20	8.39	*	-0.37	-1.54	-1.63	-2.10	-0.81	-0.13	-1.53	-1.26	-2.74	-0.94	1.23	-1.32	-0.96
21	8.48	*	-0.37	1.23	-1.22	0.10	-2.73	-0.48	-1.27	-1.75	-1.93	-0.49	-0.33	-0.69	-0.74
22	9.39	***	1.80	-0.62	1.46	1.00	0.68	1.92	2.07	1.97	1.06	1.62	-1.20	0.26	-0.55
23	10.38	**	0.96	-1.80	-0.46	-0.81	0.33	-0.36	0.93	-0.02	0.00	0.15	0.37	0.28	0.36
24	11.97	***	0.59	0.70	-0.29	0.48	-0.74	-0.30	0.60	0.46	-0.31	-0.04	-0.16	1.05	2.11
25	12.12	***	-0.79	2.55	-0.81	-0.29	-0.74	-0.13	0.13	-1.05	-1.12	-0.17	-0.32	1.25	2.05
26	16.01	***	0.96	-1.01	-0.46	0.61	0.90	0.63	1.80	1.05	0.13	-0.11	-0.46	-0.66	-1.07

Note: For the Sig Level column use the following key: *** indicates that the probability of the % of efficiency score due to Organisation Climate factors is significantly different from zero with a probability of greater than 99%. ** means the probability is greater than 95% but less than 99% and * is for cases were the probability is above 90% but below 95%. The business units not listed here all have % of the efficiency scores that have less than a 90% probability that they are not equal to zero.



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