CORPORATE INNOVATION: SOME AUSTRALIAN EXPERIENCES

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Corporate innovation has not been well studied in Australia. The present study examined the extent and type of innovation in companies listed on the Western Australian Stock Exchange and it identified the high and low innovators by calculating an Innovation Score for each of the 184 companies in the sample. Factors which influence the level of corporate innovation were also determined. Companies with high levels of innovation were found to involve company employees in the innovative process. As in America, venture teams, product champions and creative geniuses impacted on innovative capacity. The input of customers is also a valuable source of ideas for innovation. Management of high innovating companies were committed to innovation, tolerant of risk taking and encouraged autonomous behaviour in their employees. However, successful corporate innovators did not give up formal control. Rules and procedures were also important.

Keywords: corporate innovation, management, R&D, marketing, clustering.

INTRODUCTION

Innovation has been a subject of interest for researchers for more than two decades and it has become a popular topic in business studies during recent years.[1] Many believe an organisation's innovative capacity determines its ability to successfully survive in the present uncertain environment.[2] Even Tom Peters[3] recognised the importance of innovation in reducing his recommendations for excellence from ten to two: innovate constantly and strive for superior customer satisfaction. Corporate innovation is seen as a fundamental key to long-term competitive success.

While innovation is a popular topic, in some cases, its treatment has been superficial and anecdotal.[4] There is a need to develop and refine models of innovation and to subject such models to rigorous research. There is also a need to provide managers with practical advice about activating and sustaining innovative processes in their organisations. For, as Cotton and Harvey noted of a sample of British CEOs drawn from the Times Top 1000 companies, "in marked contrast to their clear recognition of obstacles, [they] were understandably vague about how to foster creativity and innovation."[5] British CEOs and probably most others know the importance of innovation and recognise the difficulties in innovating. They seem, however, to lack the skills to overcome the road blocks.

The present research is an attempt to better understand the innovation process by examining what a sample of Australian companies are actually

doing in the area. Such research is necessary as there is a need to move beyond superficiality to understand the innovative process of successful corporations and, conversely, there is a need to identify problems encountered by less successful corporate innovators. The only way this can be done is through empirical studies.

The present research draws on the work of Moss Kanter[6], who suggested that a global approach to innovation is superior to one which focuses only on product/service innovation (and possibly process innovation). She argued that "innovation-enabling innovations" (in organisational structures and work processes) facilitate and support product/service innovation and process innovation and that it is inappropriate to focus on only one aspect of corporate innovation. Rothwell[7] supports this claim and argues that organisational, management, production and commercial/marketing innovation often accompany technological innovation. This global approach to corporate innovation has been adopted in the present study.

Research on corporate innovation has also focused on the identification of managerial and organisational factors which impact positively on corporate innovation. The areas which have been found to influence the level of corporate innovation included people involved in the innovation process, aspects of organisational culture and structure and company profile.

Moss Kanter suggested that innovation is not the prerogative of the creative genius. She argued that successful innovating firms used a wide range of people as sources of innovative ideas. These include ordinary employees, customers, and top management, as well as creative geniuses. In addition, other individuals and groups become critical as the innovation process gains momentum; these being product champions and venture teams.

Moss Kanter, Tushman and Nadler, and Rothwell also highlighted the facets of corporate culture which influence innovation. These include top management's attitudes, such as their long term orientation, their vision for the organisation and their commitment to innovation. Another set of variables seems related to the behaviours of top management. These include the extent to which the group provides resources and rewards for innovation, the amount of autonomy they give to employees and their risk taking propensity.

It also seems that organic organisational structures facilitate innovation.[8] Such organisations are characterised by flat structures, an abundance of horizontal communication, decentralised decision making and a freedom from rules and procedures. Indeed, Moss Kanter likened the organisational chart of one high innovating company she studied to a plate of spaghetti. Rothwell and Zegfeld also stressed the importance of communication and cooperation between R&D and marketing in high innovating firms.

Other aspects of the company have been thought to affect the level of corporate innovation. For example, some research cites company size as having a negative impact on innovative activity and older, smokestack companies are reportedly less innovative than younger, high-tech companies.[9]

PURPOSES OF THE PRESENT STUDY

Against this background, the present study addressed a general research question about the type and level of innovative activity within Australian listed companies with head offices in Western Australia. The specific research aims were:

1. To obtain 'patterns of innovation' for these companies, derived with respect to innovation in products/services, processes, organisational structures and work practices, while taking account of: frequency of innovation, type of innovation (radical/incremental), success of innovation, importance of innovation and the total organisational impact of innovation.
2. To establish the relative impact on innovative activity of various factors such as: the people involved in the innovation process, aspects of corporate structure, facets of corporate culture and company profile (as discussed previously).

In order to achieve these aims, the following hypotheses where tested:

Hypothesis 1. Differential patterns of innovation exist across four areas of innovation; namely product/service, process, organisational structure and work practices.

Hypothesis 2. Innovative activity can be measured along a number of dimensions; specifically frequency, type (radical/incremental), success, importance and total organisational impact of such activity.

Hypothesis 3. Innovative companies make active use of multiple sources for ideas.

Hypothesis 4. Special task forces/venture teams and product champions are found in innovative companies.

Hypothesis 5. Corporations with high levels of innovative activity have 'organic structures', that is, they are flat with decentralised decision making and informal control mechanisms.

Hypothesis 6. Aspects of corporate culture, (long-term orientation, vision, top management commitment to innovation, autonomy, free resource allocation, innovation reward systems and risk tolerance) facilitate corporate innovation.

Hypothesis 7. Larger, older corporations from smoke stack industries are less innovative than smaller, younger 'high-tech' companies.

The definition of innovation used in the study was that suggested by Moss Kanter:

> Innovation is the generation, acceptance and implementation of new ideas, processes, products and services . . . It can involve creative use as well as

original invention. Application and implementation are central to this definition. It involves the capacity to change or adapt.[10]

In order to test these suggestions a questionnaire was developed and data collected from a sample of Western Australian businesses. The questionnaire and the results obtained are discussed in subsequent sections.

THE QUESTIONNAIRE

To examine patterns of innovative activity within companies, a questionnaire was developed in which respondents were asked to rate each of four areas of innovation (new product/service, new process, new organisational structure, new work practice) along five measures of innovation (frequency of innovation, type of innovation, success of innovation, importance of innovation and total organisational impact of innovation) on a series of seven point scales, as shown in Appendix 1, Section A.

The questionnaire explored multiple areas of innovation along multiple measures. Much of the previous innovation research has focussed only on the area of new products/services (or at most on new products/services and new processes); a notable exception being Moss Kanter, who suggested that innovation-enabling innovations, such as new work practices and organisational structures, are pivotal to the success of product/service and process innovations. The use of multiple measures of innovation is also a relatively unusual approach, although it has been previously used by Cooper.[11]

Questions were also asked about the role of people in the innovative process with the sources of innovative ideas in the company and involvement in the innovative process being explored. Four possible sources (top management, all employees, customer/market and the creative genius) were used. Two questions related to people involved in the innovative process (the task force/venture team and product champion) were included in the survey. (See Appendix 1, Section B.)

Organisational structure was examined by asking questions relating to tall/flat organisations, the degree of centralisation in decision making, the extent of vertical versus horizontal communication, the number of rules and procedures and the relationship between R&D and marketing, as shown in Appendix 1, Section C. It is difficult to probe the concept of corporate culture in a survey questionnaire. However, within the constraints of this approach, questions were included which examined commonly reported features of innovative corporate cultures. Variables included long-term versus short-term focus; corporate vision/mission; top management's commitment to innovation; acceptance of risk taking; the degree of autonomy granted to employees; rewards for innovation and the availability of resources for innovative activities (See Appendix 1, Section D). Questions about company age, size

(as measured by annual dollar sales and number of employees) and industry type were also asked and are shown Appendix 1, Section E.

THE SAMPLE

The population in the present study consisted of all companies listed on the first and second boards of the Western Australian Stock Exchange at 18 January, 1988 whose head offices were located in the state. Questionnaires were mailed to the CEOs of 336 first board companies and 117 second board companies, using a mailing list purchased from the Stock Exchange during August, 1988. Two follow-up mail-outs were also used. Forty-eight questionnaires were returned marked "company in liquidation" or "no longer at this address". When these obvious casualties of the October 1987 crash were subtracted from the initial mail-out figure of 453, the sample size was reduced to 405.

There were 184 usable replies; the effective return rate being 45 per cent, which is acceptable for this type of data collection procedures and better than many.[12]

The present study is a 'view from the top' and it may be argued that lower level employees have different perceptions of the practice of innovation in their companies. However, the perspective of CEOs does seem to be a resonable starting point for a study of corporate innovation. As this was the first study of its kind in Australia it was deemed important to canvass a wide range of corporations, such that patterns of innovative activity could be identified and quantified. A case study approach, while yielding a rich picture of corporate innovation, was not seen as an appropriate starting point of understanding innovation in Australian businesses as this could result in the attribution of idiosyncratic and company-specific innovative behaviours to other corporations. However, subsequent case studies would be desirable to probe specific issues raised in the present research.

DATA ANALYSIS

Preliminary Analysis

A frequency distribution was run to determine the types of industries represented by the companies in this survey. The results are reported in Table 1. It can be seen that there is a strong representation of mining companies in the survey. This is not surprising given the dominance of the mining industry in Western Australia.

A series of principal component analyses was performed on the variables outlined in the introduction and derived from the literature search, which seem to impact on innovation. These factor analyses were used to determine if there were any underlying dimensions in the various areas and to ensure that there would be no problems with multicollinearity when the people, structure and culture variables were used as independent variables in the analysis. The results of a factor analysis on the people dimension of innovation are shown in Table 2.

It can be seen that two factors with eigen values greater than one emerged; the first being termed 'grass roots innovation' and the second 'innovation by elites'. These factors, together, explained 52 per cent of the variance in the data.

TABLE 1
FREQUENCY RESULTS: INDUSTRY TYPE

Industry	Frequency (%)
Mining	34
Manufacturing	17
Wholesale/Retail	9
Recreation Personal Services	7
Agriculture/Forestry/Fishing	6
Construction	3
Community Services	1
Transport/Storage	1
Electricity/Gas/Water	1
Public Administration/Defence	1
Other	20

A principal components analysis of the items relating to organisational structure also yielded a two factor solution, which explained 62 per cent of the variance in the data. From Table 3 it can be seen that the first factor is 'organic structure' while the second factor was related to the item 'few rules and procedures'. It should be noted that the variable 'R&D and marketing work together' loaded positively onto Factor 1 and negatively onto Factor 2. In subsequent analysis, this variable was used independently of these two factors.

TABLE 2
FACTOR RESULTS: PEOPLE INVOLVED IN INNOVATION

	Factor Loadings		
Variable	Factor 1	Factor 2	Communality
Venture team process	.77		.59
Customer/market ideas	.63		.41
Product champion	.63		.42
All employees' ideas	.53		.34
Creative genius ideas		.83	.70
Top management's ideas		.80	.66
Eigen value	2.07	1.06	

Variables relating to corporate culture were subjected to factor analysis, again yielding a two dimensional solution, which explained 61 per cent of the variance in the data. From Table 4 it can be seen that Factor 1 was related to activities which promote innovation and it was named 'innovation facilitation environment'. Factor 2 was termed 'long-term orientation' because of the high loading variables.

TABLE 3
FACTOR RESULTS: ORGANISATIONAL STRUCTURE

	Factor Loadings		
Variable	**Factor 1**	**Factor 2**	**Communality**
Flat organisation	.78		.61
Horizontal communication	.76		.58
Decentralised decisions	.74		.54
Few rules/procedures		.86	.79
R&D/marketing together	.51	-.53	.55
Eigen value	2.05	1.03	

Analysis of Innovation Data

The ratings of the 184 responding companies on the four areas of innovation along the five measures used may be represented as a three-way data matrix. In order to simplify the data matrix and to search for underlying relationships a three mode Multidimensional Unfolding was initially undertaken.[13] However, there were not enough degrees of freedom in the data for this to be successful as the data resulted in a single point solution. In order to understand this unexpected phenomenon better, an alternative two-stage analysis procedure was undertaken. First, discriminant analysis was performed on the extended matrix[14] to see if there were differences across the five measures of innovation for the four areas of innovation. The four areas of innovation became the dependent variable in the discriminant analysis. The F

TABLE 4
FACTOR RESULTS: CORPORATE CULTURE

	Factor Loadings		
Variable	**Factor 1**	**Factor 2**	**Communality**
Employee risk taking	.81		.66
Resources for innovation	.80		.69
Rewards for innovation	.69		.50
Autonomy	.67		.48
Top management committed	.63		.51
Long-term goals		.88	.78
Clear vision for company		.76	.68
Eigen value	3.19	1.10	

statistic on pairs of groups[15] showed no statistical difference between groups at the 0.05 level, although organisational structure and work practice were significantly different at the 10 per cent level. Peterson and Mahajan's I^2 statistic[16] suggested that only 2 per cent of the variance in the innovation data could be explained by the analysis. It is clear that there were no significant differences between the four areas of innovation across the five measures employed as independent variables in this study. Thus there are no differential patterns of innovation across the four areas of product/service, process, organisational structure and work practice with the present sample and Hypothesis 1 was rejected.

Given that the four areas of innovation showed no significant differences, a second stage of analysis was undertaken. Factor analysis was performed on the five measures of innovation (frequency of innovation, type of innovation, success of innovation, importance of innovation and impact of innovation on the total organisation) across all areas simultaneously. However, only one factor with an eigen value greater than one (3.4) emerged, which explained 69 per cent of the variance. The next highest eigen value was only 0.66 and Hypothesis 2 was rejected. Thus the three-way data matrix, rather than providing evidence of differential patterns of innovation, collapsed to a single value or Innovation Score for each company, which was calculated using the following equation:

$$IS_k = \left(\sum_{i=1}^{4} \sum_{j=1}^{5} x_{ijk}\right)/20$$

where k = k_{th} firm

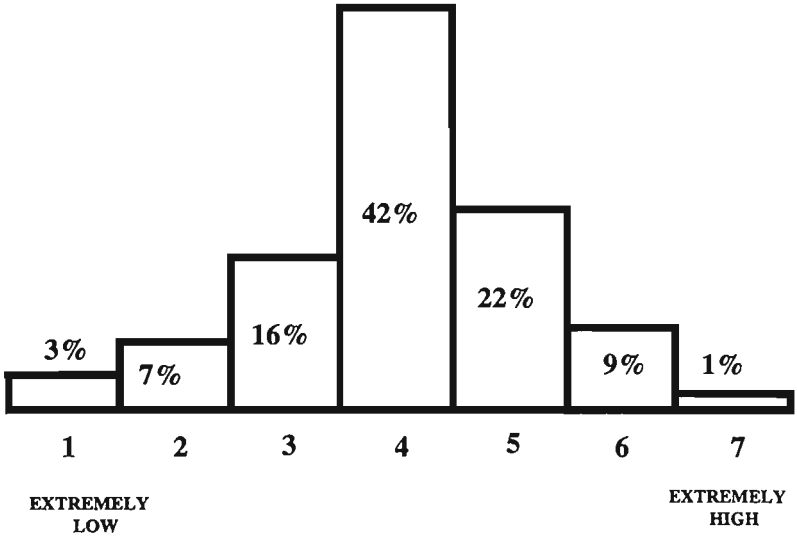
i = i_{th} area of innovation

j = measures of innovation

x_{ijk} = ij_{th} score for firm k

Consequently the Innovation Score could range from a low of 1 to a high of 7, with low scores implying little innovation and high scores implying substantial innovation. As noted earlier, the existence of a single innovation score for each company indicated that no differential patterns of innovation existed across the four areas of product/service, process, organisational structure and work practice and innovative activity could not be measured along a number of individual dimensions, at least for this sample. Innovation scores were calculated for each responding company and the results are summarised in Figure 1.

FIGURE 1
THE DISTRIBUTION OF INNOVATION SCORES



It can be seen that large numbers of companies fell into the midpoint (4) position on the innovation continuum and the distribution looks very much like a normal distribution, which was confirmed by computing a Kolmogorov-Smirnov single sample statistic. The average innovation score was 4.03, which confirmed the nature of the distribution across the scale. It can also be seen that only about a third of the companies surveyed had innovation scores as the upper end of the scale, despite the fact that 73 per cent of companies reported a top management commitment to innovation.

It is not surprising that a large number of CEOs reported a commitment to innovation given the emphasis on this concept in the late 1980s when this survey was conducted. There is also a distinct possibility that the Innovation Score which was derived from CEO reports of innovative activity in a variety of spheres may be inflated. Indeed, it is recommended that in subsequent research the measure of innovative activity incorporate both self reported achievements and independent quantitative measures of corporate success, such as ROI, growth, profits versus costs for new programs, success rates of new products, and impact of new programs on the firm's total operations (sales and profits).[17]

A second major problem addressed in this study was to determine the factors in an organisation which impact on the process of innovation. In order to answer this question a regression analysis was undertaken. Not only would such a procedure establish the relative impact (if any)

of specific organisational factors (e.g., people, structure, culture, company profile) on innovative activity, but it could also produce a profile of high and low innovating companies.

Stepwise multiple regression was used, the dependent variable being the Innovation Score. Independent variables included were 'R&D/marketing work together', 'few rules and procedures', 'industry', 'company size' by sales and number of employees, 'company age' and the various factors previously obtained from analysis of the items relating to people involved in innovation and corporate structure and culture (See Tables 2-4), These factors were 'grass roots innovation', (all employees' ideas, customer/market ideas, venture teams and product champions); 'innovation by elites' (top management's ideas and creative genius ideas); 'organic structure' (flat, decentralised decision making and horizontal communication); 'innovation facilitating environment' (top management commitment, employee autonomy and risk taking, rewards and resources for innovation) and 'long-term orientation' (long-term goals and clear vision for the company).

Forty-seven per cent of the variance in the Innovation Score was explained by the final estimated regression equation, which contained six variables. The results obtained are shown in Table 5. The beta values were very similar in magnitude, indicating that all variables included were of about equal importance in determining the Innovation Score.

TABLE 5
REGRESSION ON INNOVATION SCORE

Independent Variable	B	Beta	T values
Grass roots innovation	0.21	0.23	2.92[a]
Innovation by elites	0.17	0.22	3.08[a]
R&D/Marketing work together	0.10	0.19	2.45[b]
Few rules and procedures	-0.12	-0.17	-2.71[a]
Innovation facilitating environment	0.18	0.20	2.72[a]
Mining	-0.44	-0.18	-2.70[a]
Constant	2.13		6.12[a]
Adjusted R^2	0.47		
F	21.79		

[a] significant at the 0.001 level [b] significant at the 0.01 level

Variables relating to 'company size' and 'age', 'industry' type (with the exception of 'mining'), 'organic structure' and 'long-term orientation' were not found to impact significantly on the Innovation

Score. Companies involved in the mining industry were found to be less innovative. Thus Hypothesis 7 was not confirmed in full and it is significant that Moss Kanter identified the oil industry as being populated typically by innovation avoiders. She suggested that this was because it is capital intensive and sees little economic leverage in its internal operations. Australian mining companies fit the capital intensive model and have been shown to be relatively low innovators in the present study.

Rothwell and Rothwell and Zegfeld suggested that organic sub-systems within organisations facilitate innovation. 'Organic structures', as defined in this study, are characterized by a flat organisational chart, decentralised decision making and emphasis on horizontal communication. It is significant that this factor was not found to impact on the Innovation Score and Hypothesis 5 was rejected. It should be noted, however, that 'R&D/marketing work together' did positively influence Innovation Score. This echoes Gupta, Raj and Wilemon's[18] emphasis on functional area cooperation and the argument[19] that problems should be treated as wholes, rather than being artificially carved up for distribution to appropriate functional areas. A 'long-term orientation' was not found to be significant in determining the level of innovation in the company. This runs counter to much of the popular literature, which has been concerned about myopic responses that emphasise short-term returns.[20] The main source of ideas for innovation was top management. However, both 'grass roots innovation' and 'innovation by elites' were found to have an important positive influence on the Innovation Score. Thus Hypotheses 3 and 4 were confirmed.

Moss Kanter's work is supported in so far as an "innovation facilitating environment" has been found to impact positively on the Innovation Score. An innovation facilitating environment is one in which top management is committed to innovation and employees are given autonomy and encouraged in risk taking behaviour. Innovation is not only rewarded, but employees are given resources (money, time and personnel) to carry out innovative projects. This parallels Moss Kanter's notion of innovative organisations empowering their people by giving them information, resources and support. Furthermore, the emphasis on risk taking, which is a common theme in the innovation literature[21], was supported by this study. The aspects of corporate culture which did not impact on Innovation Score were 'long-term orientation' and 'vision'. All other corporate culture items seemed to facilitate innovation. Hypothesis 6 was confirmed in part.

The most puzzling result in the regression analysis was the negative loading of 'few rules and procedures' onto the Innovation Score. Superficially it would seem that non-bureaucratic organisations, with few rules and procedures, should enhance innovation, because they provide freedom to employees to engage in innovative activities. A closer

examination, however, suggests that this variable is at the heart of the debate about how to control an innovative organisation. Badaway[22] argued that innovative organisations find the appropriate balance between freedom and structure. He suggested that the former facilitates creativity and the latter assists productivity. Sherman's review of the eight masters of innovation, drawn from the Fortune 500 list (and voted for by academics, consultants and security analysts), suggested "while their controls may be tight otherwise, these companies often turn a blind eye to employees' attempts to sneak around bureaucratic roadblocks".[23]

Mintzberg and McHugh[24] also felt that *ad hoc* ideas achieve focused direction as a result of the efforts of visionary leaders who mobilise their people to achieve a common goal. Ekvall's study of idea management recommends that both formal and informal elements be used to enhance innovative activity, noting:

> This is a paradox, that formal procedures are needed to take care of the employees' ideas in organisations that harbour creativity — stimulating values and climates. Bureaucracy and formalism are enemies of creativity and innovation, but nevertheless we do need formal procedures and routines to be able to utilise the creative potential existing in the organisation.[25]

All this is akin to "simultaneous loose-tight" properties[26] of excellent organisations. One might ask, is the negative relationship between 'few rules and procedures' and high Innovation Score a measure of the need to keep things 'tight', given all the 'loose' qualities described previously as being important for innovation? It is difficult to answer this question in an absolute sense but the present study suggests that the presence of rules and procedures does not inhibit innovative behaviour *per se*.

CONCLUSIONS

Innovation in the companies surveyed occurred across the four areas of products/services, processes, organisational structures and work practices. There is a clear message for managers not to view innovation narrowly. High innovators in this study paid attention to and innovated in multiple spheres. However, there were no differential patterns of innovation across the four areas. Furthermore, the measurement of innovative activity along a number of separate dimensions (frequency, type, success, importance and total organisational impact) yielded a common innovation factor. Instead of finding 'patterns of innovation', a single value Innovation Score was found to be appropriate in explaining respondents' innovative behaviour.

But what exactly does this score suggest? Take, for example, a company with a high score. This high innovator engages in multi-area innovation and, in rating innovation, scores very high (and similarly) across the five measures. It seems that Moss Kanter's thesis that innovation-enabling innovations (in organisational structure and work practices)

facilitate product/service and process innovation, is true. Furthermore, it is apparent that Cooper's different measures of innovation were not found in this study, where all measures converged to a single dimension. The results show far less differentiation in corporate innovation than was originally expected. The expected complexity of patterning across four areas of innovation and five measures of innovation did not exist. This may be because the measure of innovation was determined by self report of the CEOs with no other independent measure of innovation being used (as in the case of Cooper's work) or it may be due to some particular aspects of the companies surveyed, which were mainly resource based and mining companies. This phenomenon requires further investigation, as does an analysis of reasons for some companies being high innovators and others low innovators.

The study also found that, while 73 per cent of companies reported top management commitment to innovation, only about one third of the companies surveyed had innovation scores at the upper end of the Innovation Score scale. A possible explanation of this gap between intent to innovate and actual innovation might be inferred from other information gathered. It was apparent that, while organisations espoused commitment to innovation, in practice very few provided resources and rewards for autonomous, risk oriented innovative activities in their companies. It would appear that the sample CEOs are well-intentioned about innovation but are not very adept at managing the innovative process, which makes them similar to the British managers mentioned in Cotton and Harvey's study.[27] The executive appears in many cases to lack the wherewithal to innovate effectively. In Moss Kanter's terms, about a quarter of the CEOs were innovation avoiders. Of the remaining three-quarters, many were naive about how to innovate successfully.

The second problem posed in this research was which organisational factors in an organisation impact on the process of innovation as it is important to understand exactly how companies organised themselves for successful innovation. High innovators involved all people in the process of innovation. Organisational elites (top management) and creative elites (creative genius types) contributed significantly to innovation but so did grass roots people (both within the organisation and in the market). The latter were important at all stages of the innovative process. They generated the ideas for innovation and they implemented these through their involvement in venture teams, guided by product champions. The primacy of people, so often the subject of discussion in innovation literature, has been given quantitative substantiation in the present study. Results also suggested that people who push the line that only one group (or one person) is a significant force in determining the innovative capacity of a company are misguided. This study suggests that innovative activity is enhanced by the combined efforts of many. The notion of a holistic corporation-wide innovative spirit with ideas from multiple sources is implicit in the results obtained.

High innovators also integrated R&D and marketing departments well. This supports Rothwell and Zegfeld's thesis that neither 'technology-push' nor 'market-pull' theories of innovation are appropriate. Rather, companies need to operate under an interactive model in which interdepartmental communication is facilitated.

Successful innovation flourished not merely when top managers expressed commitment to innovation but rather when they created and nurtured an 'innovation facilitating environment'. In such an environment top management was committed to innovation and employees were given autonomy and were rewarded for innovative activity. Especially important in 'innovation facilitating environments' was the willingness of top management to allow employees to engage in risk taking behaviours and to give employees the necessary resources for the pursuit of innovative projects. Furthermore, it should not be forgotten that the three 'Rs' of innovation (risk taking, rewards and resources), autonomy and commitment from the top loaded onto a common factor. Innovative activity is enhanced when these multiple variables coexist. A total approach is necessary. An 'innovation facilitating environment' is multifaceted and corporations wishing to innovate need to make system-wide initiatives along multiple dimensions. Rothwell and Zegfeld expressed this idea forcefully, noting that:

> It would of course be surprising if innovatory success or failure could be explained in terms of one or two factors only, and an important result of many innovation studies is their emphasis on multi-factor explanations. In other words, success is rarely associated with doing one or two things brilliantly, but with performing all operations competently and in a well-balanced and coordinated manner.[28]

Innovative companies also have rules and procedures. This might seem contradictory and puzzling, given that the prior description of an "innovation facilitating environment" suggested this to be characterised by autonomous risk-oriented employee behaviour. However, many theorists have claimed that formal controls are necessary to keep innovative organisations focused.[29] This argument has implicit support from the current study, where high innovating companies were shown to have rules and procedures.

Rothwell and Rothwell and Zegfeld suggested that organisations with organic subsystems are good innovators. An 'organic' dimension emerged in this research but flat organisations with decentralised decision making and horizontal communication were not found to have significantly higher innovation scores. This does not negate Rothwell and Zegfeld's claim in absolute terms. Indeed employee autonomy (implying decentralised decision making) was found in innovative environments. It would seem that, although overall organic structure (and freedom from rules and procedures) were not typical of high innovators, an organic subsystem may characterise such companies. Moss Kanter's notion of parallel organisations, one formal and one informal, has found some

support in this study. However, further in depth case analysis will be needed to prove definitively that high innovators have organic subsystems which support and reward risk taking and autonomy, while simultaneously operating within a more mechanistic, rule bound, formal structure. Innovation models must allow for the possibility of an organic subculture coexisting in a mechanistic framework instead of an organic organisational structure in absolute terms.

Mining companies were found to be relatively poor innovators but larger, older corporations from smoke stack industries were not found to be less innovative than smaller younger, 'hi-tech' companies. The lack of impact of age, size and industry variables (except mining) on innovative activity merits some comment. There is much written[30] on the negative impact of large corporate size on innovative activity yet this research did not reveal such a trend. It might be argued that the Australian based sample used was biased towards smaller companies and a re-sampling to include more large corporations might product different results. The findings on industry type also ran counter to some popular opinion which suggests that 'hi-tech' industry is more innovative than is the smoke-stack, second wave corporation. A significant amount of government policy seems to be founded on the notion of salvation in state-of-the-art technology park enterprises. This may be misguided as, with the exception of the mining industry, which tended to be low in innovative behaviour, there was no significant relationship between industry type and an organisation's Innovation Score. The good news is that all companies can innovate if the innovation process is well managed.

In the Australian business press, companies have been urged to innovate and given warnings of the consequences of their failure to do this. However, they have not always been told how to manage the innovative process. The present study can, however, offer some guidelines to managers. This study has provided a starting point of understanding the innovative process at work in individual firms. It is recommended that future research take account of these findings and also broaden the framework to consider the impact of competitive clustering on the innovative activity of individual firms and on industry groups.[31]

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APPENDIX 1

Please indicate your position on the following questions/statements by circling the appropriate number on the 7 point scale. Use as much of the scale as possible. Answer one number for each question/statement.

SECTION A

This part of the questionnaire focuses on the types of innovative activities in which your company engages. By innovation, I mean the process of bringing any new ideas into use.

1. How frequently does you company innovate in the following areas?

	Very Infrequently						Very Frequently
New product/service	1	2	3	4	5	6	7
New process	1	2	3	4	5	6	7
New organisational structure	1	2	3	4	5	6	7
New work practice	1	2	3	4	5	6	7

2. How would you describe the type of innovation which occurs in your company?

	Small Incremental						Large Radical
New product/service	1	2	3	4	5	6	7
New process	1	2	3	4	5	6	7
New organisational structure	1	2	3	4	5	6	7
New work practice	1	2	3	4	5	6	7

3. What has been the success in your company in innovations in the following areas?

	Highly Unsuccessful						Highly Successful
New product/service	1	2	3	4	5	6	7
New process	1	2	3	4	5	6	7
New organisational structure	1	2	3	4	5	6	7
New work practice	1	2	3	4	5	6	7

4. How important are the innovations made by your company in the following areas?

	Very Unimportant						Very Important
New product/service	1	2	3	4	5	6	7
New process	1	2	3	4	5	6	7
New organisational structure	1	2	3	4	5	6	7
New work practice	1	2	3	4	5	6	7

5. What has been the impact of innovations in the following areas on your overall corporate performance?

	Very Low Impact						Very High Impact
New product/service	1	2	3	4	5	6	7
New process	1	2	3	4	5	6	7
New organisational structure	1	2	3	4	5	6	7
New work practice	1	2	3	4	5	6	7

SECTION B

This part of the questionnaire focuses on the people who are involved with the innovation process in your company.

	Very Infrequently						Very Frequently
6. Top management generates ideas for innovation in your company	1	2	3	4	5	6	7
7. All employees generate ideas for innovation in your company	1	2	3	4	5	6	7
8. The customer/market is a source of ideas for innovations in your company	1	2	3	4	5	6	7

	Very Infrequently						Very Frequently
9. A "creative genius" in your company is the source of ideas for innovation	1	2	3	4	5	6	7
10. A special task force/venture team is responsible for the innovation process in your company	1	2	3	4	5	6	7
11. A "product champion" is actively involved with the innovation process in your company company	1	2	3	4	5	6	7

SECTION C

The following statements describe the way your company is structured.

	Very Tall						Very Flat
12. The organisational chart of your company is	1	2	3	4	5	6	7
	Very Centralised						Very Decentralised
13. Decision making in your company is	1	2	3	4	5	6	7
	Mainly Vertical						Mainly Horizontal
14. Communication in your company is	1	2	3	4	5	6	7
	Very Many						Very Few
15. Describe the number of rules procedures in your company	1	2	3	4	5	6	7
	Very Infrequently						Very Frequently
16. In your company R&D and marketing work together	1	2	3	4	5	6	7

SECTION D

This section focuses on the values your company holds.

	Short Term Goals						Long Term Goals
17. Your major company focus is	1	2	3	4	5	6	7
	Very Infrequently						Very Frequently
18. There are rewards offered to people who innovate in your company	1	2	3	4	5	6	7
	Very Infrequently						Very Frequently
19. Overall, employees in your company are given autonomy	1	2	3	4	5	6	7
	Strongly Disagree						Strongly Agree
20. Resources (money, time, personnel) are freely available to employees with innovative ideas	1	2	3	4	5	6	7

	Strongly Disagree						Strongly Agree
21. You have a clear vision for the future of your company	1	2	3	4	5	6	7
	Strongly Disagree						Strongly Agree
22. The top management in your company is committed to innovation	1	2	3	4	5	6	7
	Strongly Disagree						Strongly Agree
23. Your company accepts risk-taking by its employees	1	2	3	4	5	6	7

SECTION E

The final part of this questionnaire provides information on your company profile.

	1 to 50	51 to 100	101 to 150	151 to 200	201 to 250	251 to 300	300+
24. Total number of employees in your company	1	2	3	4	5	6	7
	Less than 1yr	1-2 yrs	3-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	More than 20yrs
25. How many years has your company been in existence	1	2	3	4	5	6	7
	Less than 6	6-10	10-20	20-50	50-100	100-300	More than 300
26. 1986/1987 annual dollar sales of your company $m.	1	2	3	4	5	6	7

27. Please indicate your industry type by circling the appropriate number.
    1. Agriculture, forestry and fishing
    2. Mining
    3. Manufacturing
    4. Electricity, gas and water
    5. Construction
    6. Wholesale and retail trade
    7. Transport and storage
    8. Public administration and defence
    9. Community Services
    10. Recreation, personal and other services
    11. Other

In the future we may be interested in discussing these question more fully with you. If you have no objections, kindly complete the following information.