

Does Individual Locus of Control Matter in a JIT Environment?

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Abstract

Higher empowerment and task involvement are accepted features of a JIT environment. However, the well studied Locus of Control (LOC) congruency hypothesis suggests that the level of involvement should align with the LOC orientation of the individual for greater job satisfaction and performance.

This study examines this potential conflict. Results show that involvement for both internal and external LOC managers in a JIT environment is crucial in improving perceived performance but that involvement is more efficient for internal LOC managers as these managers' performance improves at a greater rate. However, for job satisfaction the LOC congruency hypothesis holds in a JIT setting for both internal and external LOC managers.

Keywords:

**Locus of Control (LOC)
Just in Time (JIT)
Performance
Job Satisfaction**

Introduction

The principle focus of research from a JIT perspective has been to identify its technical aspects and to examine its benefits from an organisational level, including any financial benefits. The operations management literature tends to focus on the JIT operational innovations and structures that impact on manufacturing processes while the management accounting literature generally focuses on the impact that JIT processes have on profitability (Mistry, 2005).

More recently, suggestions have been made about its importance to Generation Y or the Millennial generation (born 1981-2001) that demand customisation (Zelinski, 2009). The hallmarks of the JIT philosophy - short production runs, shorter product life cycles, close proximity to consumer, quality product/service delivered on customer demand, are supposedly well suited to Gen Y (Baldonado and Spangenberg, 2009). Zelinski (2009) also argues that Gen Y is well suited to work in such an environment. This suggestion, together with the renewed focus on job satisfaction (Furnham, et al., 2009) highlights the need for research in JIT at the individual level. The increasing transient nature of the global employment market have employers playing close attention to the attitudes, including job satisfaction, of their staff in the hope of retaining exiting staff rather than retraining new staff (Jain, et al., 2008).

Given the significant changes the JIT approach creates in the work place (Peters and Austin, 1995) it is surprising that little attention has been placed on examining individual behavioural considerations. The introduction of JIT can induce job-related stress, which can have a detrimental effect on individual performance in terms of long-term productivity, work quality and decision making (Inman and Brandon, 1992; Peters and Austin, 1995; Godard, 2001). To go beyond the technical and uncover behavioural aspects of JIT adoption may help explain the equivocal findings in the literature as to JIT's ultimate affect on performance. Earlier research praised its benefits (Flynn et al., 1995; Callen et al., 2000; Callen et al., 2003), later research identified constraints (Polito and Watson,

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2006) and questions remain regarding any ultimate financial benefit (Balakrishnan, et al., 1996; Kendall and Steen, 1998; Clarke and Mia, 1993). Benefits of JIT have come under attack and warnings of its unrestricted pursuit are documented (Polito and Watson, 2006).

Both accounting and managerial literature has uncovered the importance of understanding individual differences in work contexts (Furnham, et al., 2009). An individual's personality can help explain the different responses of two employees working in similar conditions (Jain, et al., 2009). Locus of control is a personality variable that has been used successfully by behavioural researchers (Ng, et al., 2006). Locus of control is a dispositional variable that reinforces outcomes in life that are controlled either by one's own action (internally orientated) or by other forces (externally orientated). This personality variable would be particularly relevant in a JIT situation due to the increased expectation of workers solving problems for themselves, the removal of inventory (exposing the rocks in the lake) and then eliminating the inefficiencies. The locus of control congruency hypothesis suggests that individuals will be more job satisfied and perform better in settings where their locus of control orientation matches that of their external environment.

This research examined the job satisfaction and perceived performance of individual managers working in a JIT environment. Specifically, it examined how the interaction of a manager's degree of JIT involvement and their locus of control orientation affected their job satisfaction and perceived performance. The evidence suggests that increased involvement for both internal and external locus of control managers is crucial in improving performance. Further, that involvement is more efficient for internal managers as these managers' perceived performance improved at a greater rate than external managers as degree of JIT involvement increased. This finding is contrary to the locus of control congruency hypothesis suggesting that requirements of the JIT work setting were more important than a external managers' locus of control orientation. However, for job satisfaction the locus of control congruency hypothesis held in the JIT work setting for both internal and external locus of control managers.

The following section outlines the JIT philosophy, relevant literature and hypotheses. This is followed by the research method, results and finally the discussion.

Background and Relevant Literature

JIT Philosophy

The JIT philosophy is concerned with the elimination of activities that do not add value to the product being manufactured (Kinney and Wempe, 2002). Overall the JIT system allows a business to become more responsive to customer requirements through the elimination of all inefficiencies in all aspects of an enterprise and its supply chain (Kendall and Steen, 1998).

Although JIT has many benefits, Balakrishnan et al. (1996) pointed out that adopting JIT production does not automatically increase profit because the benefits from JIT adoption may be offset by its many direct and indirect costs. Significant training and implementation costs, increased dependence on suppliers, higher risk of plant shut-down, development of a flexible cross-trained workforce and cost and availability of normally required computer-aided design and drafting software are some of the costs associated with JIT implementation (Crusoe et al., 1999). The additional operational risk of JIT technology needs to be compensated through excess profits (Callen et al., 2003). Research has also indicated that the many changes and imperatives that JIT brings about can have profound effects on employees such as higher stress levels (Klein, 1989; Inman and Brandon, 1992; Godard, 2001).

JIT and Performance

A review of research in this area reveals that the impact of JIT on performance is unclear. Balakrishnan et al. (1996) argued that JIT adoption would increase a firm's return on assets (ROA) through an increase in a firm's competitive advantage, lowering inventory levels and a decrease in asset base due to the freeing-up of both capital and physical assets. On average, the researchers did not find a significant ROA response to JIT adoption. Clarke and Mia (1993) studied the extent of JIT adoption and found that of the 35 respondent firms in their study that used JIT, only approximately one-half reported

improvements in some performance measures. These findings are similar to Kendall and Steen (1998) who concluded from a comparison of JIT and non-JIT firms that JIT as an overall production process did not appear to improve efficiency significantly. However, Flynn et al. (1995) observed performance improvements in firms adopting JIT. Further Callen et al. (2000) when comparing JIT and non-JIT firms on a number of criteria established that JIT firms achieved greater productivity, higher profits and lower total and variable costs than their non-JIT counterparts and Callen et al. (2003) found that this profitability was significant even after adjusting for the additional operational risk of JIT technology.

Other research has demonstrated that contingency variables play an important role in determining the success or otherwise of the JIT philosophy. Flynn et al. (1995) established that infrastructure practices such as information feedback, management support and workforce management improved JIT performance. Kalagnanam and Lindsay (1998) found that JIT firms utilising an organic model of management showed higher performance than firms using a mechanistic organisational structure. Other factors which have been shown to affect the success of JIT include organisational culture, corporate strategy, degree of intensity of market competition and the provision of performance related information (Sohal et al., 1993; Chong and Rundus, 1999; Mia, 2000).

Although the contingency approach has been criticised for underspecifying complex relationships (Drazin and Van de Ven, 1985; Van de Ven and Drazin, 1985), it is a useful approach in gaining an understanding of when and how benefits are obtained from a system and in explaining conflicting research results (Brownell, 1981; Frucot and Shearon, 1991; Otley et al., 1994; Flynn et al., 1995; Selto et al., 1995; Kalagnanam and Lindsay, 1998). Selto et al. (1995, p. 665) argued that 'the adoption of new manufacturing practices such as Just-in-time (JIT) and total quality management (TQC) is only the first step to improving manufacturing performance. Even more crucial is the fit between manufacturing practices and organisational design, structure and process'.

Studying various contingency constructs, Selto et al. (1995) discovered that a misfit between worker empowerment required by JIT practices and existing authoritarian management helped explain the detrimental effect on workgroup performance. Research conducted by Sohal et al. (1993) found that the main issues to be addressed when implementing JIT relate to human resource development and management, not production methods and techniques. Indeed one of the constraints of JIT highlighted by Polito and Watson (2006) was inadequate human capital. The working conditions under JIT promote greater managerial responsibility and accountability (Groebner and Merz, 1994; Peters and Austin, 1995) this in turn can lead to better motivation and ownership or alternatively induce job-related stress, which can have a detrimental effect on individual performance in terms of long-term productivity, work quality and decision making (Inman and Brandon, 1992; Peters and Austin, 1995). To predict more accurately the organisational conditions which facilitate successful implementation and operation of JIT, Power and Sohal (1997) argue for a greater understanding at the individual level. This is in line with Ashton et al. (1995) that maintain people's behavioural response to systems and processes shape the organisation and with Brownell and Merchant's (1990) link between managerial performance and organisational performance.

Employee empowerment is a key expectation in a JIT environment (Bhimani and Bromwich, 1991; Sohal et al., 1993; Rayburn, 1996; Langfield-Smith et al., 1998; Crusoe et al., 1999; Horngren et al., 2000; Ratnatunga, 2001). Lower level managers need to be given the authority and capacity to solve problems and improve process as they intimately know the system and can make more timely changes. Power and Sohal (2000a) argue that "... JIT requires and facilitates greater levels of employee involvement that will be critical to success (or otherwise) oversimplifies the profound nature of these changes..." (Power and Sohal, 2000b, p.933). For the companies involved in Power and Sohal's (2000a) study, employee involvement was found to be a critical element in the successful operation of JIT. This finding is in line with Selto et al. (1995) who argued that workgroup performance was impeded because of a

conflict between an authoritarian management style and employee empowerment. The appropriate extent and management of employee involvement within a JIT environment could be the key to successful JIT adoption.

An important personality variable that has been shown to impact on performance and job satisfaction in participative settings is locus of control (Watson and Baumal, 1967). Although personality variables have been important in the examination of managerial and organisational performance under various management and accounting practices (Vroom, 1960; Mitchell et al., 1975; Abdel-Halim and Rowland, 1976; Brownell, 1981, 1982b; Chenhall, 1986; Licata et al., 1986; Chenhall and Brownell, 1988; Mia, 1989; Frucot and Shearon, 1991; Harrison, 1992, 1993; Otley et al., 1994; Selto et al., 1995) there is a dearth of research examining individual differences within a JIT environment.

Locus of control is one of the most studied variables in psychology and the other social sciences (Rotter, 1990, p.489). This is not surprising considering its applicability across a wide range of situations (Joe, 1971; Brownell, 1981, 1982b). Lefcourt (1966, p.207) defined locus of control in the following manner:

As a general principle, internal control refers to the perceptions of positive and/or negative events as being a consequence of ones own actions and thereby under personal control; external control refers to the perception of positive and/or negative events as being unrelated to ones own behaviours in certain situations and therefore beyond personal control.

Watson and Baumal (1967) suggested that individuals perform most efficiently in situations where actual environmental locus of control and the individuals' preferred locus of control are congruent. Thus, a congruent situation occurs for internal individuals when they possess control, whereas congruency exists for external individuals when control is determined by chance.

The need for empowerment within a JIT environment means an understanding is required as to the effect of this empowerment given the different locus of control orientations

of managers. Indeed, the conflict between the authoritarian management and empowerment in Selto et al.'s (1995) study could in part be explained by the personalities of the subjects involved. Mitchell et al. (1975), utilising a questionnaire, found that internal locus of control 'superiors' were generally more considerate and less directive than external locus of control 'superiors'. In a laboratory experiment, Licata et al. (1986) also found that internal 'superiors' were more willing to allow subordinates greater participation than external managers. Runyan (in Mitchell et al., 1975) argued that internal locus of control individuals show greater work involvement and prefer a participative style of management compared to external locus of control individuals who would appear frustrated under a similar style. Studies by Brownell (1981, 1982b), Mia (1989) and Otley et al. (1994) examining a budget scenario show that subordinate managers performed better and were more job satisfied when their locus of control matched that of the environment when examining a budget scenario. Thus, the extent of involvement needs to be balanced with the locus of control orientation of the managers concerned.

In establishing the locus of control hypothesis, Rotter (1966) intended the construct to be broad allowing its application to a variety of behavioural situations (Rotter, 1990). It is argued that the basic locus of control congruency premise, as put forward by Watson and Baumal (1967) will hold under a JIT scenario. An underlying phenomenon of the basic locus of control congruency thesis is the perception of control or influence (Rotter and Mulry, 1965). The level of control or influence exercised by managers and employees within the plants to deal with the production flow would determine the locus of control nature of the environment. The JIT environment encourages efficiency, timing and quality of production within a demand-driven production system. It is expected that managers and employees be responsible for dealing with and managing the demands, distortions and process improvement efforts at the plant therefore the source of control over performance is internal. Thus, characterizing this high degree of involvement as an internally controlled situation, congruence will only exist for individuals who are internal on the locus of control dimension. Internals are hypothesised

to perform better in this situation than externals. Further, for those internals a higher degree of JIT involvement will be associated with higher performance. Alternatively, an externally controlled situation would be characterised, as one in which there was a low degree of JIT involvement. Although in this situation congruence will occur for individuals who are external on the locus of control dimension, it is expected that this would clash with the necessary empowerment required within a JIT environment thus generating lower performance for external individuals. This leads to hypothesis one as follows:

H₁: There will be a significant interaction between degree of JIT involvement and locus of control affecting perceived performance.

JIT and Job Satisfaction

There has been renewed interest in job satisfaction driven mainly by the ever increasing transient workforce taking advantage of opportunities across the global marketplace (Jain, et al. 2009). Organisations need to retain highly skilled employees and are endeavouring to understand organizational attitudes, such as job satisfaction (Giffith, et al., 2000). What impacts on the job satisfaction of managers working in a JIT environment? Does the personality variable of locus of control have an impact?

The need to understand the human impact of JIT has been highlighted in past research (Scott et al., 1992; Groebner and Merz, 1994). Groebner and Merz (1994) reported positive changes in attitudes during the implementation period and after two years of operating under a JIT system. Norris et al. (1994) and Mullarkey et al. (1995) reported improvements in job satisfaction with the introduction of JIT. Scott et al. (1992) found that levels of job satisfaction tended to increase for production workers as their JIT involvement increased, whereas supervisors and management-level personnel showed no systematic differences in satisfaction as their levels of JIT involvement increased. However, other research suggests that JIT can induce job-related stress (Klein, 1989; Peters and Austin, 1995), which can affect job satisfaction. Job satisfaction is not only essential in terms of employee wellbeing and life satisfaction, but it also has a significant impact on employees' behaviour

and ultimately organizational effectiveness (Hirschfeld, 2000). Job satisfaction has been found to be negatively correlated to absenteeism and employee turnover (Leung and Dunk, 1992), both of which are costly to an organisation.

Locus of control has been found by previous research not only to moderate the relationship between participation (involvement) and performance (Watson and Baual, 1967; Brownell, 1981, 1982b; Frucot and Shearon, 1991 and Otley et al., 1994), but to also moderate the relationship between participation (involvement) and job satisfaction (Mitchell et al., 1975; Brownell, 1982b; Mia, 1989). Mitchell et al. (1975) reported that internals were more satisfied with a participatory management style than externals and that internal managers allowed subordinates greater participation than external managers. Brownell (1982b) discovered that internals would appear more satisfied with their job under a high budgetary-participation condition (an internally-controlled situation) than under a low participation condition (an externally-controlled situation) while externals were found to experience congruence under low participation and appear more satisfied with their job under that condition. Mia (1989) found that internals were more likely to participate in budget decision making than externals and that internals were more likely to have favourable attitudes toward their jobs and employers than externals.

By implementing involvement as advocated by JIT, if a manager is able to exert substantial influence on JIT practices employed at the plant, the source of control over job satisfaction is internal. Thus, in line with the congruency hypothesis internals will appear more job-satisfied in this situation than externals. Further, for those internals, a higher degree of involvement will be associated with higher job satisfaction. Alternatively, an externally controlled situation would be characterised as one in which there was a low degree of JIT involvement. Although in this situation congruence will occur for individuals who are external on the locus of control dimension, it is expected that this would clash with the necessary empowerment required within a JIT environment. This would produce lower performance for external individuals. This leads to hypothesis two as follows:

H₂: There will be a significant interaction between degree of JIT involvement and locus of control affecting job satisfaction

Research Method

A mail survey was used to collect data for the study. Survey methodology was chosen for its usual advantages such as greater external validity, limiting interviewer bias and the probability of gaining a larger sample to reduce sampling error. The other benefit of utilising this methodology was to allow a sample to be drawn from a cross section of manufacturing plants employing JIT thus increasing the probability of obtaining a greater variation in the variables of interest. The level of analysis in this study is the managers and supervisors within a plant. Callen et al. (2000) justifies the examination at plant level rather than firm level because a multi-plant firm will not necessarily adopt JIT in all or even most of its plants. The sample was restricted to manufacturing plants to increase homogeneity within the sample, without losing variation among the firms and was limited to Australia thus limiting any cross section differences due to general market conditions and culture. Also plants had to be autonomous thus allowing some control over decision making. To minimise any size effect plants were required to have at least 50 employees. The minimum of 50 employees criterion was also used by Callen et al., 2000.

Identification of JIT Plants

Given that there was no available database identifying plants across Australia that utilised JIT, the 29 plants initially contacted were identified by the following four means.

1. Industry bodies¹ were contacted. This method revealed 13 plants utilising the JIT philosophy.

¹ ANet, Australian Centre for Management Accounting Development (ACMAD), Australian Institute of Purchasing and Material Management (AIPMM), Australian Production and Inventory Control Society (APICS), CPA Australia, Chartered Institute of Management Accountants (CIMA), Institute Certified Management Accountants, Logistics Association of Australia and Queensland Manufacturing Institute.

2. Thirteen academics across Australia with relevant JIT research experience were contacted. Pursuing this line of inquiry resulted in the identification of an additional three plants.
3. Word searches were conducted on the Australasian Business Intelligence (ABIX) database using the search strings “just-in-time” and “JIT” as a free text search. This resulted in the identification of 10 plants using JIT manufacturing.²
4. The managers of plants contacted were asked if any of their other Australian plants also used JIT. This led to a further three plants.

The plant manager or equivalent of each identified plant was contacted. Contact details were obtained from *The Business Who's Who of Australia* and *Kompass Australia*. The contact was made for two reasons. The first was to ensure that those plants participating were global JIT users and, secondly, to request participation. It was necessary to ensure prior to sending the questionnaires that the plants were global JIT users because, if one plant uses only one component of JIT while another plant adopts a global implementation of JIT, putting both in the same group would induce heterogeneity within the sample (Callen et al., 2000). To determine the existence of global JIT adoption a modified version of a method developed by Callen et al. (2000) that employed a checklist of 17 JIT techniques was utilised. The plant managers were asked to indicate which of the 17 JIT techniques were adopted at their plant. If the plant manager could confirm that nine out of the 17 techniques were used, the plant was classified as a JIT adopter. This is in line with Callen et al. (2000) and addresses criticism of past research, where organisations that used one JIT practice were compared with others that used 10 (White, 1993). Thirteen plants fulfilled the criteria and the plant manager agreed to allow their personnel to participate. The average number of JIT practices used by the plants was

² A number of other organisations were identified during the search but were discarded because (a) they were foreign firms with no Australian manufacturing plant, (b) were distributing subsidiaries for foreign firms only, (c) had been taken over by another firm already identified as a JIT manufacturer, (d) used JIT delivery but did not use JIT in the manufacturing sections of the plant or (e) were solely a transport company.

Table 1: JIT Practices Utilized by the 13 Plants

JIT Practice	No. of Plants that use each JIT Practice
Market-paced final assembly rate	9
Kanban	10
Integrated product design	6
Integrated supplier network	8
Lowering set-up times	12
Quality circles	12
Focused factory	10
Preventative maintenance programs	10
Line balancing	10
JIT education programs	6
Level schedules	9
Stable cycle rates	5
Group technology	8
Improving quality of the product	12
Improving quality of the process	12
Fast inventory transportation systems	6
Multi-skilled workers	12

12 with a range between 9 and 16. Table 1 lists the JIT practices and the number of plants that used each practice.

The above process was necessary to ensure a stable JIT culture. Instability could lead to issues of trust which are important in times of significant change or uncertainty (Busco, Riccaboni and Scapens, 2006 and Chenhall and Langfield-Smith, 2003).

The manufacturing processes of the 13 plants included the manufacture of plasterboard, door and window hardware, pharmaceuticals, lawn care products such as mowers, motor vehicles and automotive components including dash boards and metal fabrications including electrical enclosures, metal outdoor building structures and springs. Tests (*t-test* and *Mann-Whitney U test*) were carried out to examine any bias that may have been caused by differences in manufacturing processes and for state differences. There were no differences detected.

Questionnaire Distribution

The plant managers indicated the number of questionnaires that should be sent. A total of 154 questionnaire packages, including a reply paid envelope, were posted to the 13 plant managers for distribution to managers at their plants. The managers were selected by the plant managers to participate in the study. Therefore the sample was not random, but

nonetheless was not influenced by the researcher. This approach does create a potential for bias, however, this limitation was balanced with the time and cost of collecting the data.

Follow-up letters and additional questionnaire packages were sent one and a half to two weeks later. To examine for non-response bias, the mean values of the variables from the first 20% of returns and those from the last 20% were compared using *t-tests* (Chenhall and Langfield-Smith, 1998). No significant differences were identified, suggesting the absence of non-response bias.

A total of 79 questionnaires were returned, giving a response rate of 51 percent. Nineteen of these questionnaires had to be discarded leaving a useable sample of 60 (a useable response rate of 39 percent). Of the 19 responses discarded³, nine responses were excluded because the respondents indicated that they were not responsible for any employees, thus casting doubt on whether the individuals held a suitable position of authority at the plant. A further 10 were discarded due

³ The mean values of the variables which could be constructed for the 19 incomplete responses that were excluded were compared using *t-tests* with the mean values of the 60 useable responses (Brownell and McInnes, 1986). No significant differences were detected, suggesting that the exclusion of the incomplete returns did not introduce any bias.

to incomplete data. Table 2 presents the descriptive statistics for the sample of managers who participated in the study.

Variable Measurement

The instruments used to capture the variables were well developed measures that have been used extensively in previous research. The measures and the instruments are listed below and are discussed fully in Appendix One. The descriptive statistics are presented in Table 3.

Table 2: Sample Manager’s Descriptive Statistics (n=60)

	Mean	Median	Minimum	Maximum
Age	42	43	25	59
Years supervisory experience	14	13	1.5	35
Years with firm	17	16	1	41
No. employees responsible for	124	53	1	740

Table 3: Descriptive Statistics (n=60)

	Mean	Median	Std. Dev.	Theoretical Range		Actual Range	
				Min.	Max.	Min.	Max.
Degree of JIT Involvement	15.06	15.00	2.60	4	20	4	20
Locus of Control	7.92	8.00	2.30	4	20	4	16
Perceived Performance	6.94	7.00	0.73	1	9	5	9
Job Satisfaction	79.86	80.00	8.13	20	100	54	97

Degree of JIT Involvement: Modified version of Vroom’s (1960) psychological participation instrument.

Locus of Control: Four Item Instrument derived from Rotter’s (1966) Locus of Control Instrument.

Perceived Performance: Mahoney et. al (1963; 1965) self rating measure.

Job Satisfaction: 20-item short verion of the Minnesota Satisfaction Questionnaire (Weiss et al., 1967).

Analysis and Results

The hypotheses tests the effect of locus of control on the relationship between degree of JIT involvement and perceived performance or job satisfaction. The hypotheses were tested using the following regression equation.

$$Y = \beta_1 + \beta_2X + \beta_3Z + \beta_4 |(X - Z)| + \epsilon$$

Where:

Y = perceived performance, as measured by the global rating on the Mahoney measure, OR Job satisfaction, as measured by the overall score from the Missesota Satisfaction Questionnaire.

X = standardised locus of control score $([X_i - X]/\sigma_x)$.

Z = standardised degree of JIT involvement score $([Z_i - Z]/\sigma_z)$.

$|(X - Z)|$ = interaction between locus of control and degree of JIT involvement measured as the absolute value of the difference between the standardised locus of control score and the standardised degree of JIT involvement score.

The interaction term used in the above regression equation was chosen because it matches expectations of how locus of control and degree of JIT involvement affect performance or job satisfaction. As discussed

previously, internals are expected to perform better and have greater job satisfaction in a situation of high degree of JIT involvement. In contrast, externals are expected to perform better and have higher job satisfaction in a situation of low degree of JIT involvement. As can be seen from the interaction term, low scores on locus of control (internal) combined with high involvement scores (high degree of JIT involvement) produce large absolute difference terms. Similarly, high scores on locus of control (external) combined with low involvement scores (low degree of JIT involvement) produce large absolute difference terms. Both of these combinations are expected to be associated with higher perceived performance or higher job satisfaction. The other two combinations (internal and low degree of JIT involvement and external and high involvement) produce lower absolute differences and are expected to be associated with lower perceived performance and lower job satisfaction.

To accept the hypotheses in a fashion consistent with expectations a significant positive coefficient (β_4) was required. A significant coefficient (β_4) indicates an interaction between locus of control and degree of JIT involvement affecting perceived performance or job satisfaction. The more common multiplicative interaction term was not used because, consistent with Brownell's (1982b) finding, the multiplicative interaction term works well for extreme values of X and Y but does not perform well across the entire range.

Table 4 shows the results of the multiple regression examining perceived performance.⁴

⁴ Assumptions relating to regression were considered. An examination of the residual plot revealed that the residuals fell fairly randomly, with relatively equal dispersion about zero, indicating that linearity, normality, homoscedasticity and independence of the residuals were not a major concern (Hair et al., 1998, p.173). The normal probability distribution (Coakes and Steed, 1999, p.29) and the Kolmogorov-Smirnov test (Levin and Rubin, 1998, p.839) gave further evidence for data normality. The Cook's distance statistic and a plot of the residuals confirmed the non-existence of outliers. The residuals were also plotted against the predicted values of the dependent variable and there was no evidence of the existence of influential outliers (Hair et al., 1998, p.225 and Tabachnick

The coefficient of determination (R^2) revealed a value of 24.9 percent indicating that 24.9 percent of the variation in perceived performance was explained by the variability in locus of control, degree of JIT involvement and the interaction between the two independent variables (Hair et al., 1998, p.143). The *F-test* shows that the regression as a whole was significant at the one percent level (Levin and Rubin, 1998, p.745). The interaction coefficient (β_4) was found to be significant at the five percent level, thus demonstrating that there was an interaction between locus of control and degree of JIT involvement affecting perceived performance. The positive sign of the β_4 coefficient suggests that the hypothesis can be accepted.⁵

To determine the nature and form of the interaction term, the regression equation derived above was plotted using the extreme values for locus of control (four represented internal, 16 represented external) and degree of JIT involvement (four represented low involvement, 20 represented high involvement).⁶ To display the result graphically, locus of control was dichotomised and the manager's degree of JIT involvement was plotted against the predicted perceived performance values. Due to the standardising of the independent variables, a value of -4.25 on the x-axis represents low degree of JIT involvement while a value of 1.9 represents high degree of JIT involvement. Figure 1 shows that there was an interaction between locus of control and degree of JIT involvement

and Fidell, 1989, p.130). A comparison of the simple correlations between the independent variables with that of the correlation of either or both with the dependent variable showed that multicollinearity was not a problem Pindyck and Rubinfeld (1976, p.68).

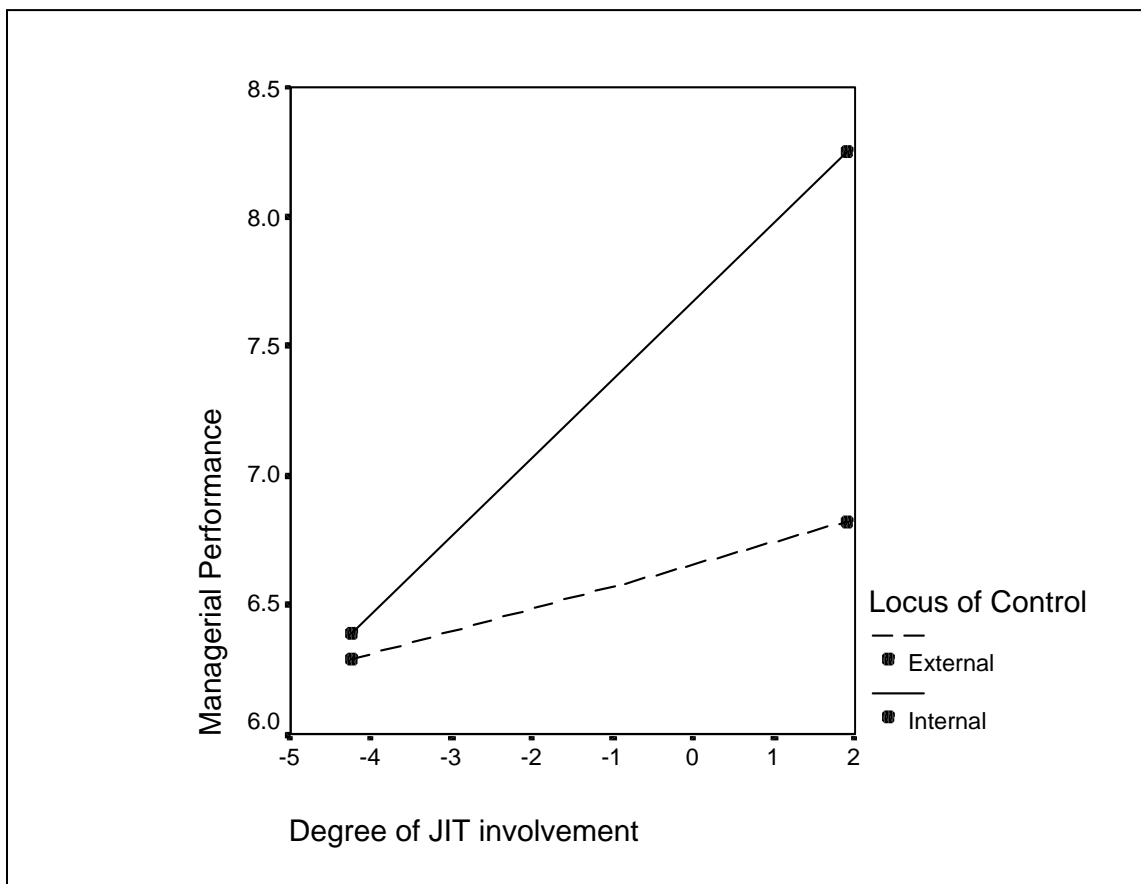
⁵ The Spearman rank-order correlation coefficient was also computed (Siegel, 1956) given the argument that Likert scales only provide an ordinal measurement scale. The result is consistent with expectations.

⁶ Previous researchers (Lau et al., 1995) have plotted the mean managerial performance for the four groups (internal/high involvement, internal/low involvement, external/high involvement and external/low involvement). However, dichotomising locus of control and degree of JIT involvement in this manner resulted in inadequate numbers in three of the four groups.

Table 4: Results of Regression: $Y = \beta_1 + \beta_2X + \beta_3Z + \beta_4 |(X - Z)| + \epsilon$

Variable	Coefficient	Value	Standard Error	t-statistic	p-value
Constant	β_1	6.724	0.132	51.050	<0.001
Locus of control	β_2	-0.205	0.088	-2.335	0.023
Degree of JIT involvement	β_3	0.271	0.088	3.072	0.003
Interaction term	β_4	0.185	0.087	2.135	0.037
$R^2 = 0.249$					
F-test, $p = 0.001$					

Figure 1: Perceived Performance Interaction Graph



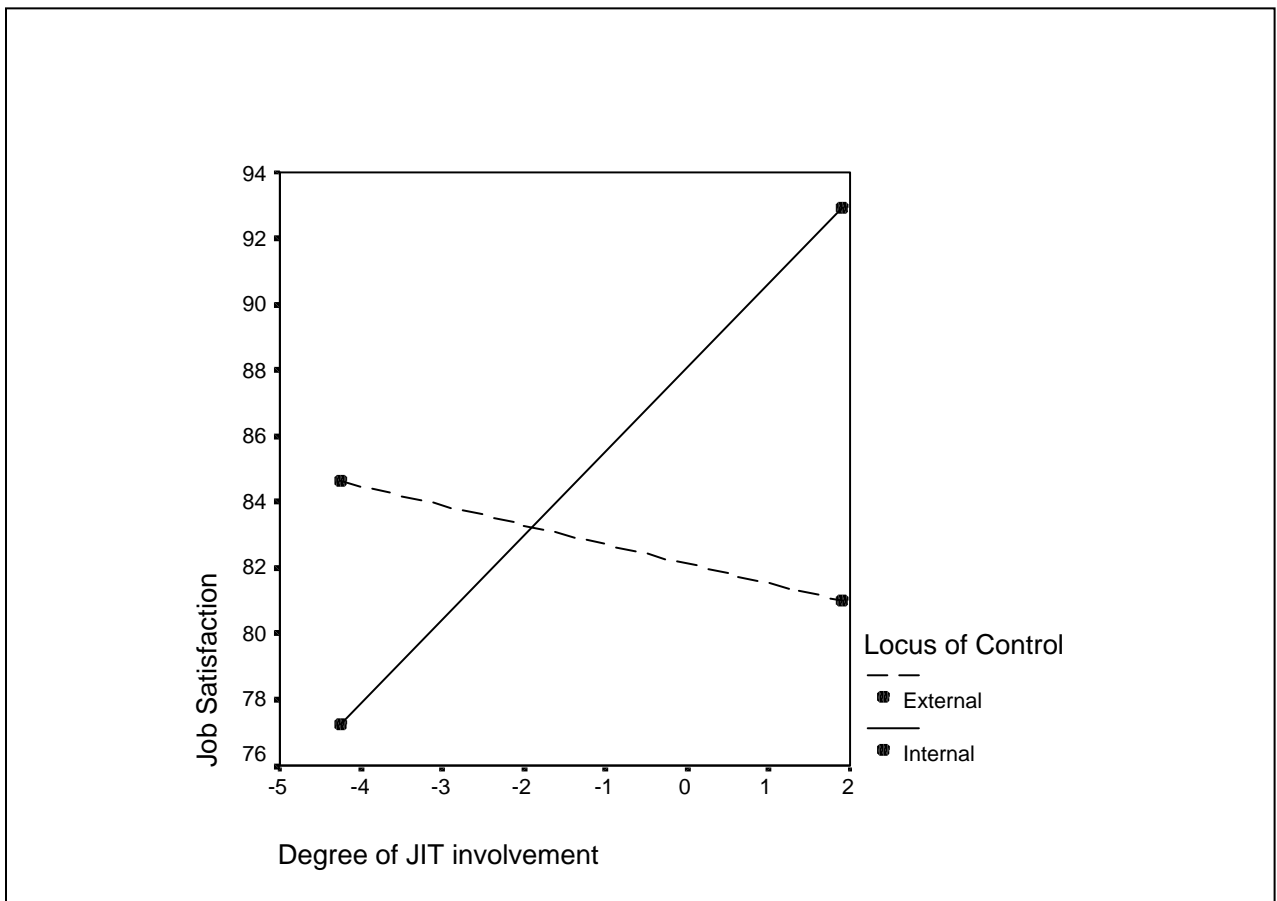
affecting perceived performance. As expected, internally-orientated managers performed better in their job in a situation of high degree of JIT involvement. However, externally-orientated managers did not perform better in a situation of low degree of JIT involvement. Furthermore, internally-orientated managers performed better than externally-orientated managers regardless of the managers' degree

of JIT involvement. Thus, the interaction hypothesis was accepted, but not in a manner consistent with expectations. Given the significant interaction it would be inappropriate to interpret the main effects and therefore no attempt was made to do so (Stangor, 1998, p.194).

Table 5: Multiple Regression Results: $Y = \beta_1 + \beta_2X + \beta_3Z + \beta_4 |(X - Z)| + \epsilon$

Variable	Coefficient	Value	Standard Error	t-statistic	p-value
Constant	β_1	76.157	1.447	52.634	<0.001
Locus of control	β_2	-1.430	.970	-1.474	0.145
Degree of JIT involvement	β_3	2.228	1.094	2.037	0.046
Interaction term	β_4	3.064	.997	3.073	0.003
$R^2 = 0.185$					
F-test 5.072, p = 0.003					

Figure 2: Job Satisfaction Interaction Graph



The results of the multiple regression⁷ for Hypothesis Two are shown in Table 5. The regression model is significant at the one-percent level and explains 18.5 percent of the variation in job satisfaction. The interaction coefficient (β_4) was positive and significant, which suggests the hypothesis can be accepted.

To determine the nature and form of the interaction term, the regression equation derived above was plotted using the extreme values for locus of control and degree of JIT involvement. Figure 2 shows that the interaction between locus of control and degree of JIT involvement affecting job satisfaction was in a manner consistent with expectations. In other words, internal managers appeared more satisfied with their job in a situation of high degree of JIT involvement while external managers appeared more satisfied in a situation of low degree of JIT involvement.

Conclusion and Discussion

At a general level this study provides evidence of the impact individual behavioural variables can have on performance and job satisfaction. Specifically, the findings show that perceived performance and job satisfaction were affected by the interaction between degree of involvement and locus of control in a JIT environment. An analysis of the nature and form of the interaction revealed, as expected, that internal managers performed better and had a higher degree of job satisfaction in their job in a situation of high degree of JIT involvement. This result is consistent with the congruency hypothesis proposed by Watson and Bauml (1967) and supported by Brownell (1981, 1982b), Frucot and Shearon (1991) and Otley et al. (1994). Scott et al. (1992) found that there were no systematic differences in job satisfaction at the managerial level as their JIT involvement increased. However, a major difference between this study and that of Scott et al.'s study is the stage of implementation.

⁷ Assumptions relating to the use of regression were assessed. The analysis conducted revealed that linearity, normality, homoscedasticity and independence of the residuals were not a major concern (Hair et al., 1998, p.173). There were also no outliers present and the correlation matrix conducted attests to the absence of multicollinearity.

Great care was taken in this study to ensure a stable global JIT environment.

However, for external locus of control managers the congruency hypothesis holds for job satisfaction but not for perceived performance. Further, the results also demonstrate that in a situation of congruence internals appeared more satisfied with their job than externals. This result supports Mitchell et al. (1975) who suggested that externals generally were more dissatisfied with organisational life because they felt they had little control over work related outcomes. Mia (1989) also reported that externals were less likely to have a favourable attitude toward their jobs and employers.

There are several implications that may be drawn from the results. Firstly, the results suggest that involvement for both internal and external managers in a JIT environment is crucial in improving perceived performance. This supports previous research that found the strategy of empowering employees was central to the effective operation of the JIT methodology (Power and Sohal, 2000b). Thus, it would appear that involvement promoted under JIT does not conflict with managers' locus of control orientation to the detriment of perceived performance. Though, it seems that involvement is more efficient for internal managers as the results showed that internal managers' performance improved at a greater rate than external managers as degree of JIT involvement increased.

However, the management and degree of employee empowerment will need to be managed wisely given that for external locus of control managers job satisfaction decreases as the degree of JIT involvement increases. Further, Godard's (2001) research suggests that under work practices such as JIT there is a collision between the 'good' factors such as empowerment and belongingness and the 'bad' factors such as an increase in stress and a diminished work quality. The study shows that the effect of this collision is not uniform across all individuals.

Secondly, by examining the well established locus of control congruency hypothesis, the study not only took the opportunity to explore the gap in knowledge at the individual and behavioural level with respect to JIT, but also

enabled the testing of the transferability of the locus of control congruency hypothesis to another participative situation. Such testing is necessary to ensure findings will hold across different settings (Otley et al., 1994).

Thirdly, the findings of this research provide support for other studies (Flynn et al., 1995; Selto et al., 1995; Kalagnanam and Lindsay, 1998; Chong and Rundus, 1999; Mia, 2000) that have applied the contingency framework to help gain an understanding of the variables that determine the success or otherwise of JIT. Conflicting findings in previous research on the impact of JIT on performance (Clarke and Mia, 1993; Flynn et al., 1995; Balakrishnan et al., 1996; Kendall and Steen, 1998; Callen et al., 2000) established the importance of investigating the circumstances in which JIT would be successful.

Several limitations of the current study should be considered. Firstly, the theoretical framework is simplistic. It focuses on one element of an individual manager, namely locus of control. Further research could reflect a wider variety of individual differences (i.e. leadership style, degree of authoritarianism, trust, employee versus manager) as well as contextual factors (i.e. strategy, organizational structure, reward structure, automotive manufacturing).

There are several limitations associated with the research method employed in this study. Firstly, self-ratings which are highly subjective, were used to assess perceived performance. Secondly, the manufacturing plants and the subsequent managers and supervisors who participated in the study were not randomly selected. This could have introduced a degree of systematic bias and effect the generalisability of the study. Finally, studies of this kind, which employ cross-sectional surveys, do not provide confirmatory evidence of a causal relationship. Future research could seek to overcome the above by; using a more objective measure of performance; randomly selecting participants; or conducting a longitudinal study.

Given the suggestion that culture may impact on the transferability of locus of control (Frucot and Shearon, 1991; Otley et al., 1994) and also the questioning of the successful application of JIT practices in organisations

across a range of cultures (Stower, 1995; Bamber, et al., 1992), the generalisability of the results may be somewhat restricted to Australia. Future research could explore this.

Despite these limitations the study does have important implications for human resource management in plants seeking to implement the JIT philosophy and practices. For these plants the evidence suggests that a high degree of involvement is necessary to improve performance for all personality types. However, this will require careful management as the evidence suggests there is a decrease in job satisfaction for external locus of control personalities as involvement increases.

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Appendix 1: Variable Measurement

Degree of JIT Involvement

The instrument used to measure degree of involvement was a modified version of Vroom’s (1960) psychological participation instrument. ‘Participation is viewed as influence in a process of joint decision-making by two or more parties, in which the decisions have future effects on those making them’ (Cook et al., 1981, p.206). Degree of involvement was operationalised as the managers’ perceived influence in the decision-making process regarding JIT. Thus, Vroom’s measure is appropriate as it ‘sets out to measure “psychological” participation, the amount of influence which a person perceives himself or herself to possess’ (Cook et al., 1981, p.206).

The instrument, which is presented in Appendix 1, consisted of four items, each with a five-point response dimension. The final score was the total of the responses on the four dimensions, giving a score ranging from four, representing low degree of JIT involvement, to 20 representing high degree of JIT involvement. Item-to-total Pearson correlation

coefficients ranged from 0.708 to 0.810 - significant at the one percent (two tailed) level, which is greater than the 0.50 benchmark suggested by Hair et al. (1998) for satisfactory internal consistency. Thus the summated scale was a reliable measure of the degree of JIT involvement variable. Cronbach’s alpha supported the above findings, yielding a value of 0.78. The instrument used is presented below with the descriptive statistics for the degree of JIT involvement responses presented in Table 3.

Degree of JIT Involvement

Just-in-time (JIT) is a manufacturing philosophy based on the continuous improvement of productivity and the planned elimination of activities which do not add value to the product being manufactured. The primary elements of JIT include demand driven production, organising production in manufacturing cells, hiring and retaining multiskilled workers, emphasising total quality management, reducing manufacturing lead time and set up time, building strong supplier relationships and only having the required inventory on hand.

1. In general, how much say or influence do you feel you have on JIT practices in your plant? <i>(Please circle.)</i>				
1	2	3	4	5
No influence	Some influence	Quite a bit of influence	A great deal of influence	A very great deal of influence
2. Do you feel you can influence the decisions of your immediate superior regarding things about JIT practices which concern you? <i>(Please circle.)</i>				
1	2	3	4	5
To no extent	To a very little extent	To some extent	To a considerable extent	To a great extent
3. Does your immediate superior ask your opinion when a problem comes up that involves JIT practices? <i>(Please circle.)</i>				
1	2	3	4	5
Never asks	Seldom asks	Sometimes asks	Often asks	Always asks
4. If you have a suggestion for improving the job or changing the process in some way regarding JIT practices, how easy is it for you to get your ideas across to your immediate superior? <i>(Please circle.)</i>				
1	2	3	4	5
Very difficult	Fairly difficult	Not too easy	Fairly easy	Very easy

Locus of Control

Locus of Control has been widely researched and as such there have been numerous instruments developed to measure the construct (for example, Lefcourt (1982) lists eight instruments). Rotter’s (1966) complete scale (consisting of 23 items) has been used extensively, and has been found to be a reliable and valid measure for locus of control (Organ and Greene, 1974; Mitchell et al., 1975; Brownell, 1981, 1982b; Licata et al., 1986; Mia, 1989; Tsui and Gul, 1996; Bernardi, 1997). However, there has been some criticism of the use of the instrument in studies where the items would seem irrelevant for the respondent. An example put forward by Lefcourt (1981) describes a dying man being asked to give a judgement about how school grades should be assigned. It is for this reason that a four-item short-form of Rotter’s (1966) Locus of Control Scale was used to measure respondents’ locus of control orientation. The advantage of the four-item instrument was that it did not focus on specific situations such as classroom experiences, which would not be appropriate for the managers. The four-item instrument has been used successfully as a measure of locus of control by previous researchers (Wolfle and Robertshaw, 1982; Sweeney et al., 1991; Li-Ya et al., 1999). The four items have the highest loadings on the Locus of Control factor and are presented in Appendix 1.

The four questions used five-point Likert scales anchored on ‘disagree strongly’ scoring

one, and ‘agree strongly’ scoring five. The final score was obtained by totaling the responses on the four items. Items were scored so that disagreement indicated internal locus of control and received smaller numeric values. Higher scores therefore indicated an external orientation, consistent with Rotter’s (1966) 23 item scale.

The item-to-total correlations ranged from 0.508 to 0.711 and were significant at the one percent level, suggesting that the four items are measuring the same construct. Cronbach’s alpha was 0.46, which is below the generally accepted level of reliability. However, personality tests often have much lower reliability values due to the broad constructs being measured (Foster, 1998, p.203). Rotter (1990, p.491) also indicated that the measure, by its very nature, would not deliver a high alpha. The instrument used is presented below with descriptive statistics for the locus of control score presented in Table 3.

Locus of Control

Each item below contains a statement. Please circle the number, which best indicates your agreement with each statement as far as you’re concerned. Be sure to select the response you actually *believe* to be the case rather than the response you think you should choose or the response you would like to be true. This is a measure of personal belief, so there are no right or wrong answers.

	1 Disagree Strongly	2	3	4	5 Agree Strongly
Good luck is more important than hard work for success.	1	2	3	4	5
Every time I try to get ahead, something or somebody stops me.	1	2	3	4	5
Planning only makes a person unhappy since plans hardly work out anyway.	1	2	3	4	5
People who accept their condition in life are happier than those who try to change things.	1	2	3	4	5

Perceived Performance

Perceived performance was measured using the Mahoney et. al. (1963; 1965) self-rating measure.⁸ A subjective self-rating measure of performance was considered more appropriate for this study due to the perceived difficulty in obtaining objective, comparable performance data from the cross section of plants in the sample. The measure calls for a rating from one (very low performance) to nine (very high performance) on eight sub-dimensions, as well as an overall rating. The eight sub-dimensions of performance include planning, investigating, coordinating, evaluating, supervising, staffing, negotiating and representing. Previous studies that have used this instrument have found it to be a reliable and valid measure (Brownell, 1982a, 1982b; Brownell and Hirst, 1986; Brownell and McInnes, 1986; Dunk, 1989; Frucot and Shearon, 1991; Lau et al., 1995; Chong, 1998). The final perceived performance score was the overall measure.

According to Mahoney et al. (1963) the measure requires an assessment of the

⁸ Conflicting evidence exists as to whether superior or self-rating measures are more appropriate measures of managerial performance. It has been argued by some researchers that self-ratings tend to be more lenient than superior ratings (Parker et al., 1959; Kirchner, 1965; Thornton, 1968). However, in a study conducted by Heneman (1974) it was found that self-ratings possessed less leniency than superior ratings. In addition, evidence exists to suggest that self-ratings suffer less from halo error (Kirchner, 1965; Nealey and Owen, 1970, Heneman, 1974). Halo error is the tendency to evaluate "globally" or on a single cognitive dimension and is evidenced by high inter-item correlations among the separate performance dimensions (Brownell, 1982b; Frucot and Shearon, 1991).

independence of the dimensions and that the variation in the overall rating is explained by the other eight items. Methods used in previous studies to address these criteria were conducted (Brownell, 1982b; Brownell and McInnes, 1986). The results demonstrated the reliability of the overall perceived performance measure. Descriptive statistics for the final perceived performance score are presented in Table 3.

Job Satisfaction

Job satisfaction was measured using the 20-item short version of the Minnesota Satisfaction Questionnaire (MSQ) (Weiss et al., 1967). The short form MSQ provides a comprehensive measure of job satisfaction by obtaining separate reactions to 20 specific job facets. The instrument has been used successfully by previous researchers (Weiss et al., 1967; Chenhall and Brownell, 1988; Leung and Dunk, 1992; Otley and Pollamen, 2000) and has been shown to have high levels of discriminant validity (Dunham, et al. 1977). The 20 questions used a five-point Likert scale. The final score was obtained by totalling the responses, giving a score ranging from 20, representing low job satisfaction, to 100 representing high job satisfaction. Again item-to-total correlation coefficients and Cronbach's alpha were computed to assess reliability. Of the 20 item-to-total correlations, 11 were above 0.50, ranging from 0.541 to 0.725. All of the item-to-total correlations were significant, with 18 being significant at the one percent level and two being significant at the five percent level. Cronbach's alpha was 0.87. Overall, the test results suggest that the 20 item job satisfaction instrument is above the generally accepted level of reliability. Table 3 presents the descriptive statistics for job satisfaction.

