EFFECTIVENESS OF I.T. IN COMPUTERISED MAINTENANCE MANAGEMENT: A LONGITUDINAL STUDY OF THE ANALYSIS OF PHENOMENOLOGICAL PERCEPTIONS

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ABSTRACT: **EFFECTIVENESS OF I.T. IN COMPUTERISED MAINTENANCE MANAGEMENT: A LONGITUDINAL STUDY OF THE ANALYSIS OF PHENOMENOLOGICAL PERCEPTIONS.**

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ABSTRACT: The aims of this longitudinal, empirical research were to examine the phenomenological perceptions of both asset managers and support staff using qualitative and quantitative analysis for the purpose of assessing efficiency of information technology in a public sector building construction maintenance management environment and to investigate such fundamental facets as efficiency of training and information technology, the effect of information technology on human relations within the workplace, the perceived impact of information technology on the efficiency of occupational performance together with a summative evaluation of information technology in the asset management environment. The longitudinal study was conducted in a public sector building construction maintenance management environment where a new computerised maintenance management system was introduced, over the last year, in Australia. Empirical investigation was carried out through structured interview, the data was analysed through t-tests and the results revealed that both asset managers and support staff perceive information technology as beneficial in terms of both qualitative outcomes and quantitative outputs. This study concluded that, individuals from both levels of the environment being studied exhibited perceptions of information technology that were favourable and overall were consistent with the conclusions of researchers who had observed information technology's benefits in terms of other qualitative and quantitative outcomes together with a comparable study in this environment, carried out previously by the researcher. In conclusion, the observations made in this study, of both management and support staff 's perceptions of IT represent a reasonable level of support for IT in the areas of training, human relations in the workplace and efficiency of occupational performance. However there were some interesting results concerning the perceived level of control, in the workplace, by managers and support staff. The lowering of satisfaction levels generally is discordant with a multiplicity of previous research findings, as is the closing of the gap in differences generally between management and support staff's perceptions. Differences observed between the results of the two studies indicate a general reduction in the significance of the differences between the two groups regarding satisfaction with information technology as a whole. Further research is suggested in customer satisfaction, productivity levels, self perception and the interaction between perceptions and outcomes.

KEYWORDS: Phenomenological perception, efficiency, information technology, asset management, maintenance management, organisational change

1. INTRODUCTION

The aim of this study was to provide a longitudinal assessment of Information Technology (IT) in the, building construction, computerised maintenance management environment, employing empirical research to examine the phenomenological perceptions of both asset managers and support staff using qualitative and quantitative analysis for the purpose of assessing efficiency of IT in the public sector maintenance management environment, in building construction. The study, Analysis of phenomenological perceptions of effectiveness in information technology in computerised maintenance management (Clarke, 1999), developed a framework technique that was utilised in this study to investigate fundamental phenomenological facets such as, efficiency of training and IT; effects of IT on human relations within the workplace; the perceived impact of IT on the efficiency of occupational performance and a summative evaluation of IT in the asset management environment. Following the replication of the study completed (Clarke, 1999) the results were evaluated and then comparisons drawn between the two sets of results. Both sets of data were assessed using the same framework technique and statistical analysis procedures.

IT is considered by researchers and practitioners to be extremely useful in terms of increasing both quantitative and qualitative outcomes (Mathews, 1994). Mathews identified IT as being the fifth paradigm shift in the industrial revolution. "Information technology is having pervasive effects throughout the economy that are entirely analogous to the previous paradigm shift" (Mathews, 1994, p.84). This paradigm shift has resulted in the transformation of a plethora of existing organisations within the building construction industry. Mathews purports most programs of organisational change end up in failures.

Accordingly this study initially focuses on one evaluative aspect of IT's implementation, namely the phenomenological perspectives of both asset managers and support staff in terms of both qualitative and quantitative outcomes. In the replication of the 1999 study the same area of fundamental importance, namely the effects of IT on the human relations within the workplace for both asset managers and support staff has been examined. Lansbury purported that in order to optimise IT's benefits for management and support staff alike effective planning, consultation and implementation by management in co-operation with other employees is necessary (Lansbury, 1986). Gately, suggested a polarisation of skill levels would occur, as a result of the implementation of IT, in an investigation of banking, retailing and data processing. Chishti, Martin and Jacoby claim, in a study of IT's effects on a diverse range of Australian companies, that a "negative effect on the mental health and morale of employees was reported by a noticeable percentage of respondents" (Chishti, et al, 1997, p.11). This claim supports the 'resistance to change' theories because organisational change may force managers and support staff, alike, to move from their comfort zone and may impact on their mental health (Lansbury, 1986). These results could, potentially, have an impact upon morale within the building construction industry, also, if the results were generalised.

The second principal area investigated in the study is the perception of adequacy of training in the use of IT. Bodi states that, "there is a gap in the training market in terms of providing a conceptual understanding of systems and how to use them for the organisations benefit" (Bodi.1987, p.7). The results of this study may provide an opportunity to test this statement. Bodi further states that, " A poor interface may undermine an otherwise well-designed job" (Bodi, 1987, p.13). Coleman and Joseph purport that educational institutions, in Australia,

are criticised for failing to have a high commitment to training. Hence the study investigated managers versus support staff phenomenological perceptions of the sufficiency of training, effective forms of training and adequacy of training in terms of new IT developments.

The final area of investigation was differences between managers and support staff in terms of phenomenological perceptions of both quality and quantity of output. Staff perceptions of quality of output and quantity of output were analysed.

The results of this study were then compared to the results of the previous study (Clarke, 1999) and similarities and differences discussed. The areas evaluated were satisfaction with training for existing IT, satisfaction with training for new IT, satisfaction with office morale, level of perceived control, level of perceived anxiety, level of perceived quality and finally the level of perceived output. From this study, it is anticipated that other research topics would become apparent, leading to investigation of fundamentally important areas of the building and construction industry, with regard to IT.

2. METHOD

2.1 Subjects

Participants in this study include eighteen management and thirty-nine support staff, identified by occupational duties (N=57). Participants were screened for position within the organisation and occupational experience within a computerised maintenance management environment, in the building construction area.

2.2 Materials

Materials used in this study include a questionnaire designed for a previous study into a similar area (Clarke, 1999). This questionnaire examined training, human relations and occupational performance as a function of IT, utilising a Likert type scale in addition to dichotomous response and short answer type questions as well as interview.

2.1 Procedure

Participants were briefed on the background to the study and were then invited to complete the questionnaire individually, followed by a structured interview administered by the researcher

3. RESULTS

Following the data collection phase of the study the data was analysed. The unpaired t-test procedure was used with independent statistical analyses being conducted to control the type one error at 0.05.

The initial area to be investigated was the differences between management and support staff's perception of training in relation to IT. It was observed that no significant difference existed between management and support staff's perceived level of satisfaction with training for existing IT. The statistical results were: t-value = -0.217, probability = 0.8287, with a higher mean score observed for the support staff as opposed to the management staff, where a higher mean score is indicative of a greater level of satisfaction. However the difference

between the mean scores was 0.065 (see figure 1). Additionally, no significant difference was also observed between these two groups for satisfaction with training for new IT implementations as they occur (t = - 0.194, p = 0.8466), with a similar direction of results to those reported for the previous analysis (see figure 2). It was also observed that averaged across management and support staff, 98% of subjects perceived that they utilised new IT introduced into the workplace, as opposed to 1.75% whom did not. However, once again, averaged across subject groups, 32% felt they were not keeping up with new IT developments, whilst 68% believed they were.

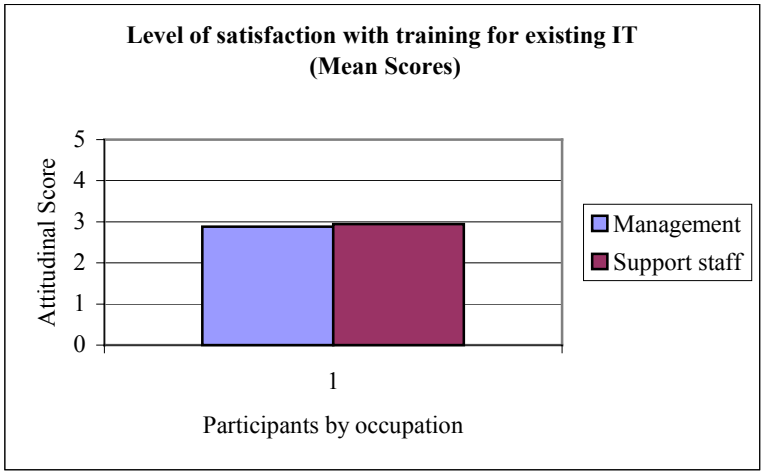

Fig. 1: Satisfaction with training for existing IT

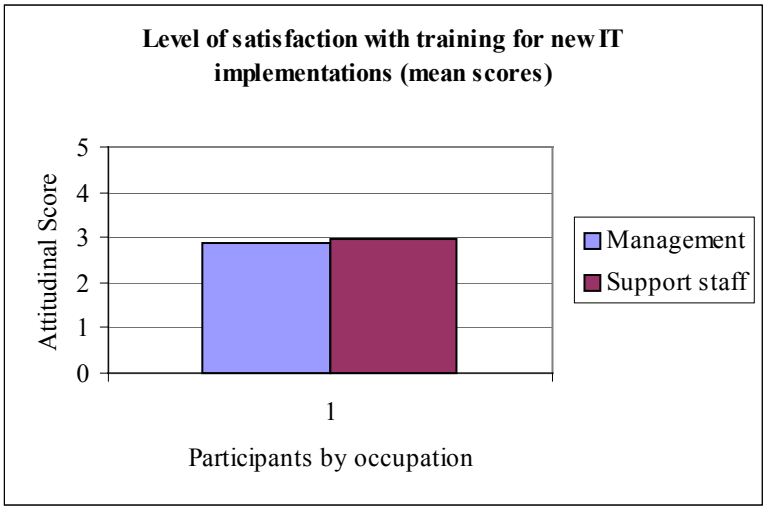

Fig. 2: Satisfaction with training for new IT

The second area of investigation concerned that of human relations as a function of IT, once again contrasting management versus support staff's phenomenological perceptions. The initial areas to be analysed concerned morale, with no significant difference being observed for the two groups perceptions of IT's effects on office morale (t = 0.201, p = 0.8411). Mean

scores for management were greater than those observed for support staff, where a higher mean score is indicative of a greater level of satisfaction. The difference between the mean scores was 0.05 (see figure 3)

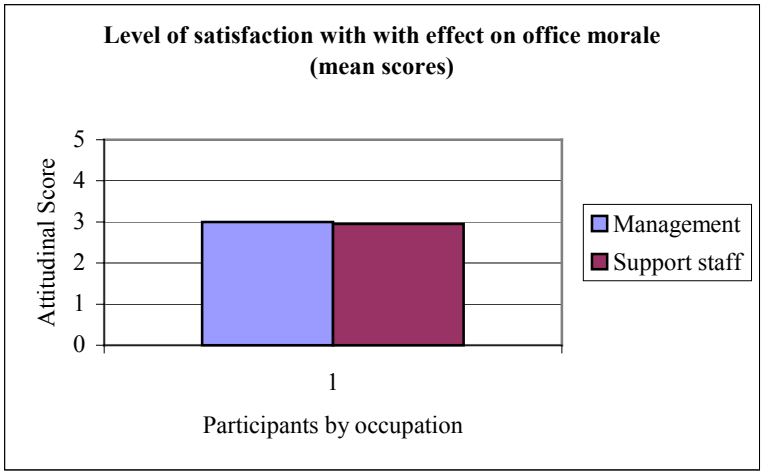

Fig. 3: Satisfaction with office morale

A different direction of results was observed for perceived control in occupational performance derived from IT, with managers believing that they had more control than support staff (see figure 4). This difference was statistically significant ($t = 2.151$, $p = 0.05$).

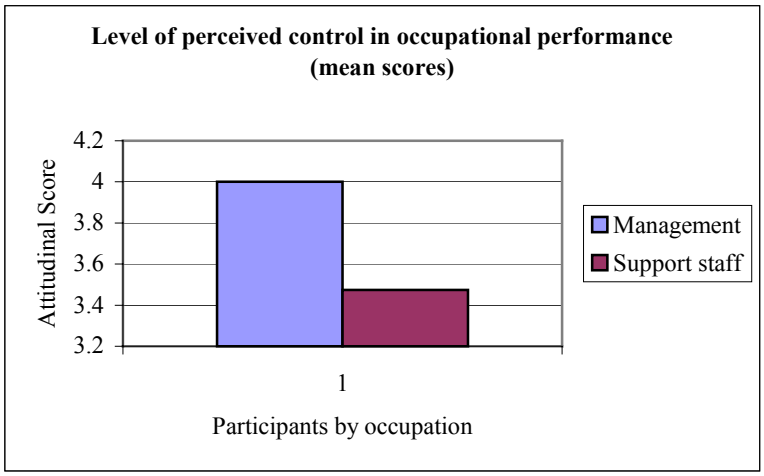

Fig. 4: Level of perceived control

Finally there was no statistically significant, observed difference between the two groups fear of redundancy as a result of IT ($t = -0.943$, $p = 0.3499$), with support staff's mean scores higher than management, where high scores indicate a low level of fear of redundancy (see figure 5).

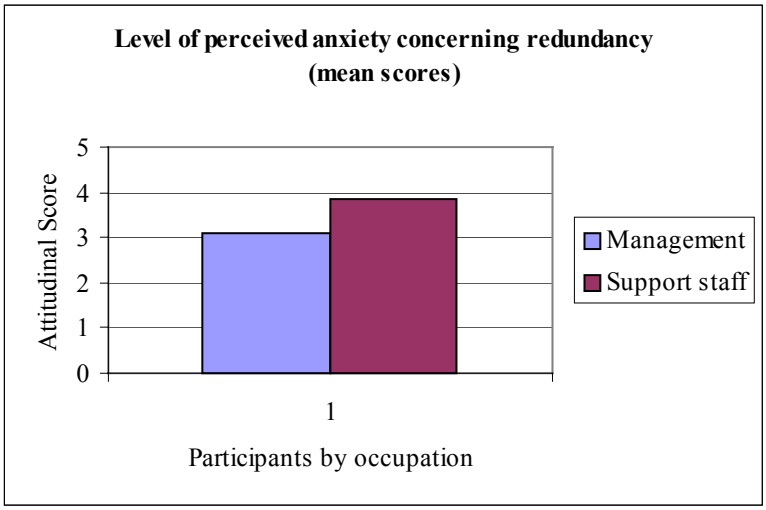

Fig. 5: Level of perceived anxiety concerning redundancy

Finally, the analysis of the differences between group perceptions of quality and quantity of service provided as a function of IT, conducted utilising the t-test procedure, outlined earlier. There was no statistically significant difference between the perceptions of management and support staff of quality as a function of IT ($t = 0.384$, $p = 0.7024$). Management demonstrated a higher mean score than support staff, where a higher score indicates a perception of higher quality of service being provided (see figure 6). The difference between the mean scores was 0.126. In the last analysis of the difference between management and support staff's perception of the quantity of service being provided, as a function of IT, no statistically significant differences were observed ($t = 0.627$, $p = 0.5333$) (see figure 7).

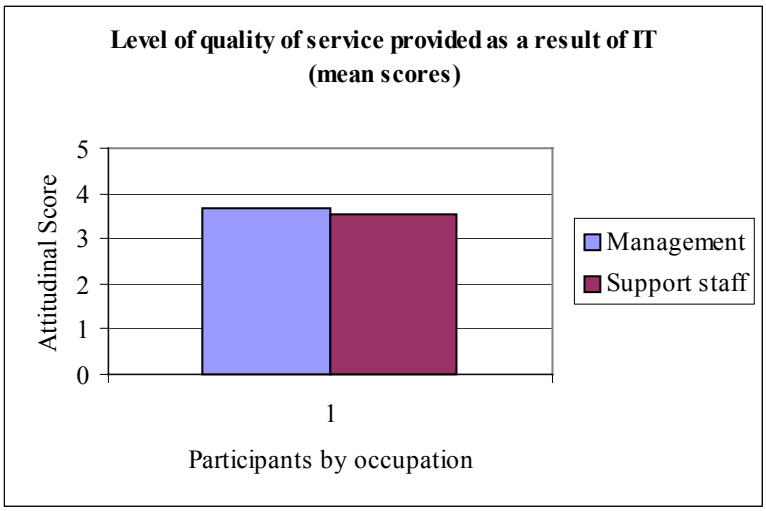

Fig. 6: Level of perceived quality of service

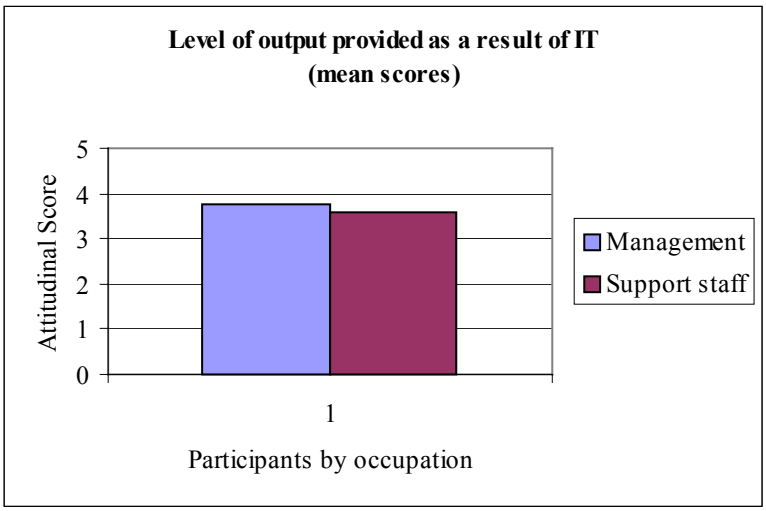

Fig.7: Level of perceived output

A dichotomous choice question evaluating IT, averaged across both management and support staff, 89% reported that they would use IT over the old methods utilised, whilst 11% felt that they would rather not use IT. It was observed that 93% reported that they would be in favour of the use of and introduction of further IT within their workplace, in the future, whilst 7% were opposed. An exploratory investigation into IT acceptance, as a function of age and experience, was undertaken and it was found that 95.5% of younger subjects favoured the use if IT, compared to 80% of older subjects, while 95.5% of younger subjects favoured the use of and introduction of further IT within their workplace, compared to 91.7% of older subjects, where old refers to 40 years of age or greater. A further exploratory investigation into IT acceptance, as a function of years of professional experience revealed that 94.1% of less experienced subjects reported they were in favour of utilising IT, compared to 69.2% of more experienced subjects, while 94.3% of less experiences subjects were in favour of the introduction of new IT developments, compared to 91.7% of more experienced subjects, where experienced refers to 10 years of experience or greater

4. DISCUSSION

Generally the results observed in this study conformed to the theoretical hypotheses derived from previous research. The differences observed between management and support staff's phenomenological perceptions of control of occupational performance within the workplace warrant further investigation because this could be an area of importance in terms of increasing the overall efficiency of information technology, through garnering support and satisfaction with IT. Further research into this aspect is considered necessary.

Initially the differences in perception of levels of training of both managers and support staff in the computerised, building construction maintenance management area were investigated. It was observed that mean scores recorded were just below 60%, for both groups, on a Likert type scale, indicating to some extent that training was moderately satisfactory. The support staff group reported a slightly higher level of satisfaction than the management group. However, the difference was so slight that practically it could be concluded that both groups were moderately satisfied with the level of training. This could be an area of concern, as the

morale of the staff may be affected, potentially resulting in lowering of levels of both qualitative outcomes and quantitative output. It is considered that this is an area that requires further research in an endeavour to ascertain initially, whether training levels truly are satisfactory, secondly, whether staff perceptions of training inadequacy are related to qualitative outcomes and quantitative output levels and finally, whether individual subject perception of their roles is significant influencing factor. The importance of training has been identified in the literature as a principal determining factor in maximising the qualitative and quantitative efficiency of IT. There has been little research conducted in the building construction field and in the specific area of computerised maintenance management.

The study proceeded to investigate the area of the effects of IT on management versus support staff's phenomenological perceptions of human relations within the workplace. Similar to the observations previously reported on the area of adequacy of training it was observed that the impact on office morale was marginally positive, as was the perceived impact that IT may make the subjects redundant, averaged across both management and support staff. There were slight variations between management and support staff but they were practically the same and there was not real concern. The analysis of the subjects with regard to their perception of the effect of IT on their level of control in the workplace produced a result that was not consistent with the direction of the other results in this study but were in accordance with expected outcomes, based on both the literature and the results of the previous study (Clarke, 1999). A statistically significant difference was observed between the management and support staff groups, with management scoring more than support staff. This disparity of opinion is interesting in that it may influence the level of both qualitative and quantitative output. Loss of control may possibly lead to dissatisfaction, discontent and a less friendly work environment, having a deleterious effect on the human relations within the workplace. Other researchers in the area have observed that low morale in the office is correlated with a diversity of problems ranging from poorer productivity to instances of mental illness (Chishti et al, 1994).

In the area of occupational performance it was observed that both management and support staff believed that both qualitative and quantitative output was positively influenced by IT. Whilst the mean scores for management were slightly higher than the mean scores for support staff for both qualitative and quantitative outputs the differences were not statistically significant.

The examination of age and years of experience in relation to IT provided interesting direction of results, that younger subjects were more accepting of IT and further implementations of IT, in the future, than older subjects. Additionally, it was evident that less experienced subjects were also more accepting of IT and further implementations of IT, in the future, than more experienced ones, but to a lesser degree. This rough correlation may be partly explained by the fact that the younger subjects were generally also the less experienced ones. Future research would be required to explore, more fully, the areas identified within this study and the previous study.

In comparing the results of this study with the study conducted one year ago it was apparent that the differences between the two groups has diminished generally. In the area of satisfaction with training the perceived level of sufficiency of training statistics, averaged across both management and support staff, fell from 3.185 to 2.915, a fall of 8%. Similarly the satisfaction with training for new IT statistics, again averaged across both management and support staff, fell from 3.874 to 2.918, a fall of 25%. In the area of human relations in

the workplace the comparison of observed results in this study to the results of the previous study reveal that IT is not perceived as having the same positive effect in the workplace. This was evidenced by a fall in the score for the perceived positive effect on office morale from 3.878 to 2.975, representing a fall of 23% and a minimal rise in perceived level of control from 3.701 to 3.737, representing a rise of 1% together with a fall in the perceived anxiety from 3.441 to 3.248, representing a fall of 5%. In the area of efficiency of occupational performance there was both a fall and a rise in the scores from this study in comparison to the last study. In the area of quality as a function of IT there was a fall from 4.206 to 3.604, representing a fall of 14.3%. In contrast there was a rise with regard to quantity, as a factor of IT, from 3.294 to 3.671, representing a rise of 11%. In summary the differences between the two studies are principally falls in acceptance of the benefits of IT in the areas of satisfaction with both existing and new training, office morale and perceived anxiety and quality of service. In contrast there was a minimal rise in the positive influence of IT in the area of perceived level of control and a substantial rise in the level of quantity of output. From discussions with the subjects, it was observed that the staged introduction of a new computerised maintenance management system, with revisions being implemented at each stage has not been an easy task. One common comment was that the overall philosophy of the new system is unclear and consequently some of the tasks may not appear to be productive. Additionally, there appears to have been some hardware and software problems requiring a solution.

In conclusion, the observations made in this study, of both management and support staff 's phenomenological perceptions of IT represent a reasonable level of support for IT in the areas of training, human relations in the workplace and efficiency of occupational performance. However there were some unexpected results, in the light of the results of this study, especially, the significant difference between the perceived level of control, in the workplace, by managers and support staff. As well as the lowered level of satisfaction generally and the coming together of perceptions for the majority of areas investigated, since the first study, in 1999. The lowering of satisfaction levels generally is discordant with a multiplicity of previous research findings, as is the closing of the gap in differences generally between management and support staff's perceptions. This, together with the significant difference in perceived level of control warrant further investigation to ascertain a more comprehensive understanding of the effect of IT, within the maintenance management environment, in the building construction area.

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