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ORGANISATIONAL LEARNING STYLE AND PRACTITIONER COMPETENCE

ABSTRACT

This paper reports on a fully structured interview survey, using a multi-sectional questionnaire, of experienced construction contract price forecasters. The aim of the research was to investigate the relationship between organizational learning styles (the learning climate of an organization, individual learning styles and approaches-to-learning) and competency (individual forecasting performance/accuracy). The results found that the degree of accuracy of the subjects' forecasts improved as their perception of the overall learning climate, and particular its working practices and staff development systems, improved. However, the relationships between their ability to learn from experience, measured in terms of individual learning styles and approaches-to-learning, and the quality of their forecasts were found to be very different from those anticipated. No significant correlations were found between forecasting accuracy and the organizational learning styles measures used, except for the learning style Reflective Observation and the approaches-to-learning dimensions labelled 'Risk-taking', 'Insecurity' and 'Self-confidence'. The results for Reflective Observation imply that those forecasters who overemphasise reflection and deliberate and ponder before taking action produce inaccurate, while the 'Insecurity' and 'Self-confidence' dimensions suggest that balanced forecasters, i.e., those who were neither insecure nor overconfident, produce more consistent forecasts. Similarly, the results for the 'Risk-taking' dimension indicate that high-risk takers tend to underestimate, while those who are more conservative tend to overestimate contract prices.

INTRODUCTION

There is an assumption within the learning organisation literature that learning will result in organisational performance improvement. Drucker (1993) maintains that knowledge is the most important resource in the modern economy, while de Geus (1988) suggests, "the only competitive advantage the company of the future will have is its managers' ability to learn faster than their competitors. Likewise, Argyris (1999) states " success in the market place depends on learning, yet most people do not know how to learn", while Mumford (1991) states that "only by the effective deployment and use of learning opportunities will organisations enable themselves to change and continue to function effectively in a turbulent environment." Elsewhere, investment in training and development has been identified as an important determinant of organisational economic growth and performance (Romer, 1993; Prais, 1995; Mason et al, 1996).

The focus of this paper is on the influence of learning within organisations on practitioner performance. Practitioners in the context of this paper are Chartered Quantity Surveyors. Quantity Surveyors are appointed by construction clients to provide cost expertise, advise on the choice of materials, construction and procurement processes, deal with planning, building regulations and architects, and to provide contract expertise (Thompson, 2004). Further, competency is measured in terms of the accuracy of construction contract price forecasts.

This paper reports on an investigation into the relationship between organizational learning styles and practitioner competency. Subsidiary objectives were to:

- To investigate the practitioner's perception of the learning climate of their organization;

- To assess individual forecasting accuracy; and

- To investigate the relationship between organizational learning styles (the learning climate of an organization, individual learning styles - the subscales of Kolb's revised learning style inventory and approaches-to-learning - the underlying dimensions of an 'approaches-to-learning' questionnaire) and competency (individual forecasting performance/accuracy).

ORGANISATIONAL LEARNING STYLE

Learning Organisation/Organisational Learning

The learning organisation is a powerful and attractive idea (Salaman, 2001). The term has been defined as: "... an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insight" (Garvin, 1994); and as "an organisation which facilitates the learning of all its members and continually transforms itself" (Pedler *et. al.* (1991). Moreover, the learning organisation "... depends absolutely on the skills, approaches and commitment of individuals of their own learning" (Mumford, 1992). However, the learning organisation concept is vague, prescriptive and seems to have little foundation in practice (Gardiner, 1999), while Garratt (1999) explains that the learning organisation is more an aspiration "… a vision, which motivates, stretches and leverages the organisation for the long term". Elsewhere, it is seen as a brand (Padaki, 2002).

The term organisational learning, as defined by Tsang (1997), "… is a concept used to describe certain types of activity that take place in an organisation, while the learning organisation refers to a particular type of organisation in and of itself. Nevertheless, there is a simple relationship between the two – a learning organisation is one which is good at organisational learning."

Measurement of learning organisations

There are very few validated learning organisation diagnostic instruments. Jashapara (2003) has developed an instrument of a learning organisation, while the following have been developed to measure the learning climate of organisations:

- Honey and Mumford's (1989a) Learning Diagnostic Questionnaire (LDQ) contains twenty paired statements that probe the working situation and how favourably disposed it is to learning. The statements relate to those 'key ingredients' though to be requisite of an ideal working situation and conducive to the learning process. Again, normative data is provided based on 207 British managers.

- Pedler *et al.* (1991) provide a Learning Climate Questionnaire (LCQ), which they suggest can be used to measure the learning climate of an individual's company, department or team. The LCQ comprises ten paired statements and scoring is by means of a seven point semantic differential. An overall score for the organisations learning climate is derived by summation of the ten scores. They provide ranges of

scores attributed to a poor learning climate and those that aspire to being learning companies. No data, however, is provided on how these ranges have been formulated.

Learning styles and approaches to learning

Rogers (1986) maintains that all adults are engaged in a continuous process of lifelong learning and have developed individual strategies and patterns of learning. Smith (1982) believes that these strategies and patterns "... enable us to deal successfully with the myriad stimuli that come our way. They permit us to conceptually organise our environment, they help pattern our behaviour, and they constitute a major component of learning style." Further, individual learning styles affect how people learn, make decisions, solve problems, and their lifestyle in general (Wolfe and Kolb, 1984).

Kolb *et al.* (1979) postulate four learning orientations that relate to the four stages of Kolb's (1976) experiential learning model. Concrete Experience - an experience-based, involved approach to learning; Reflective Observation - an observation-based, impartial approach to learning; Abstract Conceptualisation - a conceptually-based, analytical approach to learning; and Active Experimentation - an action-based, active approach to learning. Similarly, Honey and Mumford (1986) define four similar learning styles: activists, reflectors, theorists and pragmatists.

There is some disagreement over the exact nature of learning styles. Kolb (1981) suggests that preferred learning styles are not fixed traits but preferences that may vary from time to

time and situation to situation. Freedman and Stumpf (1980, 1981), Pask (1988) and Ruble

and Stout (1991) argue, however, that they should be considered as relatively stable personal

dispositions, especially when the learning environment remains relatively stable over time

Entwistle *et al.* (1979), Ramsden (1988) and Biggs (1988) draw a distinction between style

and strategy or approach: A learning **style** is a broader characterisation of an individual's

preferred way of tackling learning tasks generally (Entwistle *et al.,* 1979); a stable way of

approaching tasks, that is, an individual characteristics (Biggs, 1988) that partly controls and

organises more-fluid cognitive strategies (Ramsden, 1988). Whereas, a learning **strategy** or

approach is a description of the way an individual chooses to tackle a specific learning task

(Entwistle *et al.,* 1979; Biggs, 1988) in the light of its perceived demands (Entwistle *et al.,*

1979) and are amenable to change through intervention (Ramsden, 1988). "The capacity for

learning arises out of the range and flexibility of strategies and tactics which we can bring to

the process of learning" (Harri-Augstein and Thomas, 1991). Most people, however, are not

consciously aware of how or why they learn (Wankowski, 1991).

There are a variety of theories expounded on the influence of learning strategies or

approaches. Pask (1976) distinguishes between 'Serialist or 'Holistic' approaches to learning.

The serialist approach is to string a sequence of cognitive structures together, while the holist

in contrast, remembers and recalls material as a whole. Alternatively, Kagan discovered an

impulsivity-reflectivity dimension to individual learning (Lovell, 1980).

Measurement of learning styles and learning strategies/approaches

Several learning style diagnostic instruments have been devised. The three most commonly used instruments are:

- Kolb's (1976) Learning Style Inventory a self-report, forced choice ipsative questionnaire, created to measure the individual learning styles derived from experiential learning theory. Many studies, however, have reported low alpha coefficients (Merritt and Marshall, 1984; Sims, *et al.*, 1986; Wilson, 1986; Ruble and Stout, 1991) and poor test-retest reliabilities (Freedman and Stumpf, 1978 & 1980; Wilson, 1986; Atkinson, 1991).

- Honey and Mumford's (1986) Learning Styles Questionnaire requires respondents to either agree or disagree with 80 statements or in its shortened form 40 statements (Honey and Mumford, 1989b). Factor analysis, however, found no support the four hypothesised dimensions (Allinson and Hayes, 1988), while Fung *et al.* (1993) report low alpha coefficients for the shortened form and their factor analysis of the forty items did not reveal any coherent factor structure.

- Kolb's (1985) Learning Style Inventory is a self-descriptive instrument, forced choice ipsative questionnaire containing twelve sets of four sentence endings, which the respondents have to rank-order in a way that best describes their learning style. Like the original it is designed to measure the degree to which individuals display the

learning styles derived from experiential learning theory (Smith and Kolb, 1986). Studies report substantially improved internal consistency (Smith and Kolb, 1986; Sims *et al.* 1986 and Veres *et al.* 1987) and improved test-retest reliabilities (Sims *et al.* 1986) compared to its predecessor. Despite these improvements, a randomised version of the instrument is suggested (Ruble and Stout, 1991; Sims *et al.* 1986 and Veres *et al.* 1987), which may overcome some of the problems of a columnar response set. Also, Cornwell *et al.* (1991) and Geiger *et al.* (1992) recommended the investigation of a non-ipsative version of the inventory. Geiger *et al's* (1993) experimentation with a normative version of the inventory indicates the same relative learning style preference as the ipsative versions. Further they, confirm the existence of four separate learning abilities as factor analysis of the normative items found strong support for the four separate learning abilities.

There are several instruments designed to measure learning strategies and approaches to learning. These include:

- The Approaches to Studying Questionnaire (Entwistle and Ramsden, 1983), which is also available in a short form based on 32 items and an even shorter version, based on eighteen items. The latter measures three dimensions: an achieving orientation, a reproducing orientation and a meaning orientation. This form has been used in an extensive investigation into improving the quality of student learning (Gibbs, 1992).

- Honey and Mumford (1989a) have developed the Learning Diagnostic Questionnaire designed to give a 'rounded picture' of what is involved in being an effective learning opportunist.

- Boyatzis and Kolb (1991) have developed the Learning Skills Profile, which is a typology of skills based upon a framework of learning styles and experiential learning theory, rather than a framework of job performance or personality construct.

Application of learning styles

It has been suggested that those who show greatest career potential will excel at every stage of Kolb's cycle of learning. Kolb *et al.* (1979), Kolb (1984) and Smith and Kolb (1986) suggest that type of learning style might correlate with interest and success within certain jobs and disciplinary fields. Armstrong and McDaniel (1986) found that subjects with more reflective cognitive styles do better in problem-solving tasks. While, Allinson and Hayes (1990) found that high-flier managers score higher than their low-flier colleagues on both a Theorist/Pragmatist dimension and an Activist and negatively loaded Reflector dimension.

PRACTITIONER COMPETENCE

The benefits of 'experience' are allpervasive in construction industry folklore and frequently cited in standard texts for price forecasting practice (Ashworth and Skitmore, 1983). This has been confirmed by several questionnaire surveys in which experience is consistently rated

highly by forecasters (eg. Grieg, 1981; Ogunlana 1989; Oteifa and Baldwin, 1991; Fellows, 1996). Questionnaires also found that forecasters prefer to use individual data and experience (Grieg, 1981; Skitmore, 1985; Fellows, 1996). Similarly, Ogunlana (1989) found that experience and expertise in price forecasting were perceived to be related to:

- the ability to select relevant price/cost data;

- the ability to establish price/cost relationships and design parameters; and

- intuitive abilities necessary for adjusting rates acquired through familiarity with projects.

Experimental work by Jupp and McMillan (1981) found systematic bias (mean errors) and consistency (standard deviations) differences between forecasters and suggested that these might be attributable to differences in the forecasters' experience – the most experienced being the most accurate – but without any form of rigorous testing. Skitmore (1985) and Skitmore *et al.* (1990), in developing this approach further and on a larger scale, were able to confirm Jupp and McMillan's findings statistically, demonstrating a clear link between forecasting accuracy and the number of previous similar forecasts made by the forecaster. Skitmore *et al.* (1990) also examined relationships between several attitudinal variables and measures of forecasting bias, consistency and accuracy but found the results difficult to interpret due to the lack of a suitable theoretical framework.

A few *ad hoc* theories have been proposed. Morrison (1984), for example, has suggested that an increase in forecasting accuracy is dependent upon the means by which knowledge and experience gained on previous projects is related to future work. Brandon and Newton (1986), Brandon *et al* (1988) and Brandon (1990) for example, in considering the possibilities

for developing an expert system for price forecasting, have developed this further in linking forecasting experience to professional judgement and professional expertise, the 'expert' being said to use imagination, knowledge and experience to 'fill in the gaps' within incomplete project information. Neither of these theories however offers any explanation of the mechanism by which expertise is acquired.

Skitmore and Lowe (1995) have recently suggested that forecasting experience is acquired over time by learning from colleagues and through the rectification of errors of judgement made on past projects. Practitioners however rarely do this in a formal way (Flanagan, and Norman, 1983) and many commentators (eg. Ogunlana 1989, 1991) believe that forecasters generally underutilise whatever feedback is available. In other words, they do not learn sufficiently from their experiences – a view that is clearly inconsistent with the 'importance-of-experience' assertion. If 'experience' is so strongly believed to be an important factor in determining forecasting accuracy, why is learning from experience taken so lightly (at least in a formal sense)?

For practical progress to be made, Lowe and Skitmore (1995) recommend investigating the crucial question of how what is learned from experience may be acquired in an efficient and effective way. Research to date indicates that specific experience, such as experience in forecasting the contract prices of projects of a similar type and size, is important. However, the lack of any coherent theoretical framework makes such naive empirical approaches increasingly questionable. The theory of experiential learning offers a solution to this problem as, in treating learning as a continuous cycle of development, it coincides with the

view that the acquisition of expertise is an ongoing process, involving long and consistent practice.

EMPIRICAL FINDINGS

A fully structured interview survey was conducted (see Appendix A for details). The results are described as follows:

Individual performance

Experience profile

40 of the respondents were partners or director of their organisation (47.6%), 20 were associates (23.8%), 20 were principal or senior quantity surveyors (23.8%) and 4 were quantity surveyors (4.8%). The subjects therefore predominantly held senior positions within their organisations. The length of time the subjects had been providing general forecasting advice was a mean of 17.8 years (SD 6.9). This is comparable with the length of corporate membership of the RICS. The results (Table 1) suggest that the subjects specialised after approximately four years general forecasting experience. This is illustrated by a median difference of four years and a mean difference of 3.64 years experience respectively. All the interviewees were of an appropriate level of experience and seniority, thus producing a homogeneous sample (Rosenthal and Rosnow, 1991) sufficiently large enough to allow statistical analysis.

Individual forecasting accuracy

Summary statistics for the dependent variables that measure bias, consistency and accuracy are presented in Table 3. Those for bias (RMEAN, PMEAN and LMEAN) indicate a general tendency for the subjects to overestimate the price of the projects by a mean of $30.58/m^2$ (RMEAN), which equates to 11.63% (PMEAN). Skitmore *et al's* (1990) previous results showed a tendency to underestimate the price of the projects by a mean of $20.97/m^2$ (RMEAN), which equates to 1.00% (PMEAN).

Summary statistics for consistency (RSD, PSD and LSD) reveal slightly more consistent forecasts when compared to the Skitmore *et al*'s (1990). For example, the estimated population standard deviation of the percentage difference between the forecast and lowest bid value (PSD) equalled 26.85%, compared to Skitmore *et al's*. (1990) 27.95%.

Summary statistics for accuracy (CV, RABS, PABS, LABS, RRMS, PRMS and LRMS) reveal slightly less accurate forecasts when compared to the results obtained by Skitmore *et al.* (1990). For example, the arithmetic mean of the modulus percentage errors (PABS) equalled 27.96% compared to the 20.82% of Skitmore *et al.* (1990). As with Skitmore *et al.* (1990) and Birnie (1993), there was a tendency for subjects to be over optimistic of their forecasting ability, their mean predicted accuracy level had been 8.89%.

To examine the effects of the characteristics of the people on the accuracy of their forecasts, it was first necessary to remove any project 'effects' to avoid the possibility of confounded results. Despite several studies examining project effects, no general formulation has yet been found. As a result, it was necessary to make an empirical adjustment for project effects from the sample used. A two-way ANOVA of the data indicated there to be significant differences ($p<0.01$) in the mean forecast errors among the fifteen projects and five project types. As with the Skitmore et al (1990) study, however, with only fifteen different projects involved, there was insufficient data to do this by statistical partialling. In contrast with their study, where no adjustment was made, the data in this investigation were adjusted by deducting the mean error for each project so that the average error for each project was zero. As Levine's test also found these adjusted data to be significantly heterogeneous ($p<0.01$), the errors were finally converted to z-scores by further adjusting the errors for each project by dividing by their standard deviation for that project. A further nine summary statistics (RMEAN, LMEAN, RSD, LSD, CV, RABS, LABS, RRMS and LRMS) were then recalculated based on the modified data. The four variables based on the percentage error were not included as they produced identical results to those based on the raw error.

Perceptions of the Learning Climate

LCQ summary variables

Initially, principal components extraction with varimax rotation was used to determine the underlying dimensions of the 15 items of the LCQ. The number of factors extracted dictated

by Kaiser's criterion. This produced a three-factor solution, while a scree plot indicated that the true number of factors lay between two and four factors. Two, three and four factor solutions were carried out, and after inspecting the factor loadings matrices the three-factor solution was computed. The initial eigenvalues ranged from 5.71 for factor one to 1.13 for factor three and the solution accounted for 55.36% of the variance. The final solution was generated using principal factor extraction with an oblique (Oblimin) rotation. The three-factor solution accounts for 45.1% of the total variance in the LCQ. Variables were ordered and grouped by size and interpretive labels suggested.

Factor one 'Human Support' is associated with items the 8, 10, 4, 11, 5, 7, 6, and 9: 'People are very willing and supportive; pleasure is taken in the success of others'; 'The organisation is an open and friendly place'; 'People are usually ready to give their views and pass on information'; 'Discussion of problems is actively encouraged'; 'People are recognised for good work and rewarded for effort and learning'; 'If people develop a new skill or technique there is plenty of opportunity to use it'; 'People manage themselves and their work; there is great emphasis on taking personal responsibility'; 'Constructive feedback is often provided about your performance'. Factor two 'Staff Development Systems' is associated with the items 3, 1 and 2: 'There is a systematic process for identifying individual development needs'; 'There are lots of resources; development facilities are very good'; 'People are encouraged to learn at all times and to extend themselves and their knowledge'. Factor three 'Working Practices' is associated with the items 14, 15, 13, and 12: 'Accepts that some forecasts will prove to be inadequate'; 'Explicitly deals with risk and uncertainty'; 'Working practices and structures are constantly under review'; 'High standards are a goal to be

achieved'. Three factor scores were generated using the regression method. *The validity of these dimensions is supported by Vandenput (1973), as discussed earlier.*

Additionally, a weighted average LCQ summary variable was created.

Descriptive statistics

The alpha reliability estimate for the total scale was 0.86, while the split-half reliability estimate was 0.90. This suggests the inventory is internally consistent. Frequencies and summary statistics for the fifteen statements used in the LCQ are presented in Table 5, ranked based on their mean scores.

This indicates that the working environment within quantity surveying organisations is perceived to be supportive in terms of Human Support. Those statements given a high rating included: "The organisation is an open and friendly place"; "People manage themselves and their work; there is great emphasis on taking personal responsibility"; "Discussion of problems is actively encouraged"; "High standards are a goal to be achieved" and "People are usually ready to give their views and pass on information". This finding is important as learning within an environment requires a human communications network or society (Rogers, 1986 pp 54-55), relates to the social context within which learning takes place (Lovell, 1980 p 13), while Snell (1992) considers the main source of 'pain' in learning to be the prevailing organisational ethos of competitive individualism. Further, Freedman (1967) states that learners are more influenced by their peers than by any other factor within their

learning environment.

The results also suggested that the working environment was considered to be less supportive in terms of Staff Development Systems. Ogunlana (1991) has suggested that design offices should set up a formal system for self-evaluation that promotes learning through constructive use of process and outcome feedback. The low ratings given to a systematic process for identifying individual development needs within organisations and the provision of constructive feedback suggest that surveying organisations still have to effectively implement this.

Relationship between forecasting accuracy and the learning climate

Pearson's correlation coefficients and Spearman's rank correlation coefficients were computed between the nine measures of forecasting ability and the fifteen items of the LCQ, the LCQ summary variable and the three LCQ factor scores. The results are presented in tables 6 and 7. This analysis was exploratory in nature and is, therefore, interpreted by reference to significance levels. Also, the items and four summary variables were tested for differences between subgroups based on the level of forecasting accuracy.

No significant bias or consistency trends with the LCQ summary variable or the three factor scores were found. No significant trends were found between the 15 items of the LCQ and measures of bias, likewise no significant trends were found between the 15 items of the LCQ and measures of consistency, except the degree of consistency of the subjects' forecasts was

found to decrease as their perception of the organization in terms of its recognition of work increased (RSD and LSD both significant at the 5% level). .

The degree of accuracy of the subjects' forecasts was found to improve as their perception of the learning climate of the organization (LCQ summary variable) increased (RABS, LABS, RRMS, and LRMS all significant at the 5% level); improve as their perception of their organization's working practice (factor score) increased (RABS and RRMS both significant at the 5% level); and improve as their perception of their organization's staff development systems (factor score) increased (RABS, and RRMS both significant at the 5% level).

Analysis of variance found significant differences in the LCQ summary variable and the factor scores labelled Working Practices (at the 1% level) and Human Support (at the 5% level) for subgroups based upon the subjects' forecasting accuracy. For the LCQ summary variable the mean score of subjects with the lowest degree of accuracy (group 3) was significantly lower than that of subjects with the highest degree of accuracy (group 1) and those with a moderate degree of accuracy (group 2), both significant at the 5% level. For the factor score labelled Working Practices the mean score of subjects with the lowest degree of accuracy (group 3) was significantly lower than that of subjects with the highest degree of accuracy (group 1), significant at the 5% level and those with a moderate degree of accuracy (group 2), significant at the 1% level. For the factor score labelled Human Support the mean score of subjects with the lowest degree of accuracy (group 3) was significantly lower than that of subjects with a moderate degree of accuracy (group 2), significant at the 5% level.

The degree of accuracy of the subjects' forecasts was found to improve as their perception of the following LCQ items increased: the opportunity to introduce new skills, discussion of problems, working practices, provision of resources (RABS, LABS, RRMS, and LRMS all significant at the 5% level); and the item relating to the identification of needs (CV significant at the 5% level).

The Kruskal-Wallis test found significant differences in the LCQ item related to the discussion of problems (at the 1% level) and in the items relating to the opportunity to introduce new skills and how the organization deals with risk and uncertainty (both at the 5% level) for subgroups based upon the subjects' forecasting accuracy. For the LCQ item related to the discussion of problems the score of subjects with the lowest degree of accuracy (group 3) was significantly lower than that of subjects with the highest degree of accuracy (group 1), significant at the 5% level, and those with a moderate degree of accuracy (group 2), significant at the 1% level. For the items relating to the opportunity to introduce new skills the score of subjects with the lowest degree of accuracy (group 3) was significantly lower than that of subjects with the highest degree of accuracy (group 1), significant at the 5% level, and those with a moderate degree of accuracy (group 2), significant at the 1% level. For the item relating to how the organization deals with risk and uncertainty the score of subjects with the lowest degree of accuracy (group 3) was significantly lower than that of subjects with a moderate degree of accuracy (group 2), significant at the 1% level.

The results above indicate that, while there appears to be little or no relationship between the learning climate of an organization and measures of bias and consistency in the subjects

forecasts, with the exception of the LCQ item relating to the recognition of work, there does appear to be an association between aspects of the learning climate and measures of accuracy. They found accuracy to clearly improve linearly as the subjects' perception of the learning climate (LCQ summary variable), working practices, staff development systems and specifically the LCQ items relating to the opportunity to introduce new skills, discussion of problems, working practices, provision of resources and the identification of needs increase. Additionally, the subjects with the lowest degree of accuracy had a poorer perception of the learning climate (LCQ summary variable), working practices, human support and specifically the LCQ items relating to the discussion of problems, opportunity to introduce new skills and how the organization deals with risk and uncertainty.

Relationships between forecasting accuracy and learning styles and approaches to learning

The measures of bias, consistency and accuracy were correlated with the LSI - 1985 subscales and the approaches to learning questionnaire (ALQ) factor scores. The results are presented in table 7. This analysis was also exploratory in nature and is, therefore, interpreted by reference to significance levels. Also, the subscales and factor scores were tested for differences between subgroups based on the level of forecasting accuracy.

Individual Learning Styles

The means, standard deviations and reliability coefficients for the LSI - 1985 subscales are presented in Table 4. The alpha reliability estimates were similar to those obtained by Geiger *et al.* (1993), ranging from 0.74 to 0.88, while the split-half reliability estimates range from 0.80 to 0.92 for the four main subscales scores. This indicates that the inventory is internally consistent.

No significant bias, consistency or accuracy trends with the CE, AE, AC-CE and AE-RO dimensions were found. No significant trends were found between the subjects' learning style subscale scores and measures of bias and no significant trends were found between the subjects' learning style subscale scores and measures of consistency except the degree of consistency of the subjects' forecasts was found to deteriorate as the Abstract Conceptualisation subscale score increased (LSD significant at the 5% level). However, Lilliefors (Kolmogrow-Smirnov) test of normality indicated that a non-parametric test was more appropriate. The relationship was not, however, significant when Spearman's correlation coefficient was calculated.

The degree of accuracy was found to deteriorate as the subscale score for Reflective Observation increased (LABS, and LRMS both significant at the 1% level and RABS significant at the 5% level) and deteriorate as the Abstract Conceptualisation subscale score increased (LABS and LRMS both significant at the 5% level). Also, the investigation found no significant differences in the learning style subscales scores for subgroups based upon the subjects' forecasting accuracy. These results indicate a homogeneous group in terms of learning styles.

Approaches to Learning

Initially, principal components extraction with varimax rotation was used to determine the underlying dimensions of the 24 items of the ALQ. The number of factors extracted dictated by Kaiser's criterion. This produced an eight-factor solution that did not meet the criteria of a simple structure as many variables were complex. A scree plot indicated that the true number of factors lay between five and seven factors. Seven, six and five factor solutions were carried out, and after inspecting the factor loadings matrices the six-factor solution was computed. The initial eigenvalues ranged from 4.91 for factor one to 1.28 for factor six and the solution accounted for 56.8% of the variance. The final solution was generated using principal factor extraction with an oblique (Oblimin) rotation. The six-factor solution accounts for 43.7% of the total variance in the ALQ. The internal consistencies of the six factors were measured by the squared multiple correlations. At 0.84 for factor one, 0.78 for factor two, 0.83 for factor three, 0.68 for factor four, 0.77 for factor five and 0.77 for factor six they were internally consistent. Variables were ordered and grouped by size and interpretive labels suggested.

Factor one 'Risk-taking' is associated with the ability to take risks, see connections, adjust quickly, and convert ideas into action and openness. Factor two 'Self-management' is associated with the ability to assess ones own development needs, analyse, and formulate action plans and review performance. Factor three 'Proactivity' or proactive experiential learner is associated with making a conscious effort to learn from experience, question things or investigate new concepts. Factor four 'Insecurity' is associated with the ability to analyse

the success of others, share experiences, adjusting quickly but <u>not</u> converting criticism into constructive suggestions for improvement. Factor five 'Passivity' or passive experiential learner is associated with making a conscious effort to learn from experience, listening and adjusting quickly, but <u>not</u> questioning things. Finally, factor six 'Self-confidence' is associated with recognising and adjusting to errors, accepting help or asking questioning. Six factor scores were generated using the regression method.

The correlation matrix for the ALQ factor scores and the nine measures of forecasting ability revealed no significant bias, consistency or accuracy trends with the factor scores labelled Proactivity and Passivity.

The level of the subjects' forecasts was found to decrease as the factor score labelled Risk-taking increased (RMEAN and LMEAM both significant at the 5% level).

The degree of consistency of the subjects' forecasts was found to deteriorate as the factor score labelled Self-confidence increased (LSD significant at the 0.1% level and RSD significant at the 1% level). Further, the degree of consistency of the forecasts was also found to deteriorate as the factor score labelled Insecurity increased (RSD and LSD both significant at the 1% level).

The degree of accuracy of the forecasts was found to deteriorate as the factor score labelled Self-management increased (LABS significant at the 5% level). However, Lilliefors (Kolmogrow-Smirnov) test of normality indicated that a non-parametric test was more

appropriate. The relationship was not, however, significant when Spearman's correlation coefficient was calculated.

Analysis of variance found no significant differences in the ALQ factor scores for subgroups based upon the subjects' forecasting accuracy.

The findings above indicate that, while there appears to be little or no relationship between approaches-to-learning and measures of bias and accuracy in the subjects' forecasts, with the exception of Risk-taking and possibly Self-management, there does appear to be an association between approaches to learning and measures of consistency. The consistency of the early-stage forecast deteriorates as the subjects' preference for the Self-confidence and Insecurity approaches increase.

DISCUSSION

The proliferation of measures of forecasting performance over complicates what should be a straightforward investigation. All of these measures have been used in past research, or occur in the literature, and hence their appearance in this research. Of the triples of bias (RMEAN-PMEAN-LMEAN), consistency (RSD-PSD-LSD), and accuracy measures (RABS-PABS-LABS and RRMS-PRMS-LRMS) the difference is purely due to whether we wish to model the errors as differences or proportions (percentage and logs being equivalently proportional). The choice is important, as a trend that is not significant for a difference measure may be significant for a proportional measure and *vice versa*. Having said this, however, the

measures of bias (RMEAN and LMEAN) and the measures of consistency (RSD and LSD) have produced consistent results. Likewise the measures of accuracy (RABS, LABS, RRMS and LRMS) have generally produced consistent results, although, there are some exceptions and the CV measure produces inconsistent results. An example of this is where the independent variable working practices is significantly correlated with RABS but not with LABS. In the absence of any theory, the choice between the two groups of measures is arbitrary. Our suggestion is that the simplest model should prevail, that is, one that does not involve transformations or significant correlations. Applying this reasoning the following measures of bias, consistency and accuracy are used to interpret the results: RMEAN, RSD and RABS.

Utilizing the above protocol provides the result that there is no significant correlation or association between either forecasting bias or consistency and the learning climate of an organisation (RMEAN and RSD are not significantly correlated with any of the learning climate variables used). However, the degree of accuracy of the subjects' forecasts was found to improve as their perception of the overall learning climate of the organization (LCQ summary variable), the organization's working practice (factor score), and the organization's staff development systems (factor score) increased. Further, the degree of accuracy of the subjects' forecasts was found to improve as their perception of the following LCQ items increased: the opportunity to introduce new skills, discussion of problems, working practices and provision of resources.

Applying the same rationale to Kolb's individual learning style subscales provides no significant correlations, except that accuracy (RABS) was found to deteriorate as the style Reflective Observation increased. The results imply that those subjects who overemphasized reflection and deliberation and pondered before taking action produced inaccurate forecasts. Overall, this is an unexpected result as Kolb (1984) has suggested the type of learning style may correlate with success within certain jobs. It has also been suggested that those who show the greatest career potential will excel at every stage of Kolb's cycle of learning (Kolb *et al.* 1979). The findings above again suggest that, in terms of forecasting bias, consistency and accuracy, this is not so.

The 'approaches-to-learning' questionnaire however indicates three important factors: Insecurity, Self-confidence and Risk-taking. The results for the 'Insecurity' factor score indicate that people who are more insecure, lacking confidence or perhaps oversensitive are less consistent. Similarly, the results for the 'Self-confidence' factor score suggest that those individuals who are overconfident, again, produce less consistent forecasts. This implies that balanced forecasters who are neither too insecure nor overconfident produce more consistent forecasts. It is not difficult to offer reasons for this finding. Being overly sensitive is likely to result in overresponses in the form overcorrections of past errors or varied advised from colleagues. The notion of the balanced forecaster is also corroborated by the 'steady' image of the quantity surveyor in general.

The results for the 'Risk-taking' factor score, indicate that high risk takers tend to underestimate, while those who are more conservative tend to overestimate contract prices.

Again, the reasons for this are clear enough. In construction contract price forecasting, clients (especially commercial clients) are much more concerned about budget overruns (underestimates) than underruns (overestimates) as overruns may make turn an originally profitable project into one that is not financially sustainable. The cautious forecaster therefore tends to err, in the parlance of forecasters, 'on the high side'. This however is still less than ideal as clients in this case tend to regret missing an opportunity to spend a little more on quality etc, especially if the forecast has forced some design change cost-cutting. Again, the archetypal 'steady' balanced forecasters appear to provide the best results.

CONCLUSIONS

The aim of the research was to investigate the relationship between organizational learning styles (the learning climate of an organization, individual learning styles and approaches-to-learning) and competency (individual forecasting performance/accuracy).

The results found that the degree of accuracy of the subjects' forecasts improved as their perception of the overall learning climate, and particular its working practices and staff development systems, improved. However, contrary to expectations no significant correlation were found between either forecasting bias or consistency and the learning climate of an organisation.

Contrary to expectations, no significant correlations were found between forecasting accuracy and experiential learning styles as measured by Kolb's inventory, except that accuracy was found to deteriorate as the style Reflective Observation increased.

Contrary to the predictions in the literature, simultaneously high scores on all four learning styles did not correlate with the forecasting performance. Also, despite references within existing literature that indicated that learning style might correlate with interest and success within certain professions (Smith and Kolb, 1986) or that career success is related to excellence in every stage of the learning cycle (Kolb *et al.* 1979), this study produced little support for a relationship between forecasting performance, as measured in terms of bias, and any approach to or style of learning, with the exception of one approach-to-learning dimension. Also contrary to expectation, a balanced set of medium scores was found to be more appropriate than any high scores on individual learning style factors.

The approaches to learning dimensions labelled 'Risk-taking', 'Insecurity' and 'Self-confidence' were, on the other hand, found to be significant. The results for the 'Insecurity' and 'Self-confidence' dimensions suggest that balanced forecasters who were neither too insecure nor overconfident produce more consistent forecasts. The results for the 'Risk-taking' dimension indicate that high-risk takers tend to underestimate, while those who are more conservative tend to overestimate contract prices. These results will be unsurprising to construction industry personnel, who are very familiar with the 'steady' image of the quantity surveyors who carry out the early-stage forecasting function. What is perhaps most

surprising, except to the quantity surveyors themselves, is that this image is fully vindicated by this study.

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APPENDIX A: DETAILS OF EMPIRICAL STUDY

Sample

The population for the investigation was experienced early-stage construction contract price forecasters (quantity surveyors) based within Greater Manchester, Central Lancashire and South Lakeland. The area of study was selected as representative of NorthWest England. It was felt that the area represented a relatively homogeneous group that would reduce the effect of locational differences on the subjects' forecasts. Ultimately, 84 practitioners from 77 practices took part. This represents 45% of the target organisations.

Questionnaire

The interviewees were required to complete a three-part questionnaire comprising:

Part A: An experience profile, provided information concerning the position of the subjects within their organisations, a self assessment of their forecasting ability and general information relating to their forecasting specialisation and workload.

Part B: The competency measure was designed to reflect an approach by a prospective client for an early-stage price forecast. In what was essentially a replication of part of Skitmore *et al'*s (1990) study, subjects were asked to choose their specific area of specialisation from a list of the five most common building types: industrial buildings, office developments, health centres, schools or residential developments. They were then required to assess the likely price (lowest bid) of three different buildings, based on a drawing, a brief

specification outline and project specific details (the building type, type of client, gross floor area, number of storeys, functional unit). The subjects were asked to state their chosen location for the project, within the NorthWest region of the UK, enabling conversion to a regional norm by using the BCIS location factor index. The forecast took the form of a price per square metre of floor area value, exclusive of external works, fees, furniture and land, and the subjects were also asked to provide an assessment of the expected accuracy of their forecast. The fifteen target projects were selected from the BCIS cost analysis files. The lowest tender received for each project was updated by means of the BCIS Tender Price Index.

The question of validity was addressed when formulating this section of the questionnaire. Care was taken to ensure that the information contained within it mirrored 'real life'. A pilot study had established what information was usually available to practitioners at this stage of the design process. While it is acknowledged that the information would not be transmitted in such a tabulated format, all subjects confirmed the appropriateness of the type, amount and level of information provided.

To overcome the possibility of potential inaccuracies within the BCIS location price index biasing the results, all the projects used in the investigation were from the NorthWest region. Care was taken, therefore, to exclude from the survey practitioners who had been involved in the live projects. Similarly, all but one interviewee selected a location within the NorthWest for their forecast. Most of the forecasts (64%) were given as NorthWest region, having a factor of 1.00, Greater Manchester (17%), having a factor of 1.02. Both regional factors were

based on large sample sizes. Further, for 90% of the forecasts the regional factor for the chosen location fell within 1.00 to 1.02.

Part C: Organizational learning styles measure - contained a learning climate questionnaire (LCQ), an inventory designed to elicit information on whether the subjects considered their organisation provided an appropriate climate; a revised randomised version of Kolb's (1985) Learning Style Inventory (LSI - 1985); and an approaches to learning at work questionnaire (ALQ). The LCQ required the subjects to rate fifteen pairs of statements on a five-point semantic differential scale. The chosen statements were derived from Pedler *et al's* (1991) measuring the quality of your learning climate; Honey and Mumford's (1989) work situation items and Mumford's (1980) ways in which supervisors can improve the learning climate. The original scoring method of Kolb's LSI - 1985 was replaced by a four-point agreement scale. The rationale for this was to remove the ipsative nature of the inventory. The choice of a four-point scale was dictated by a desire to force a choice between agreement/disagreement with each item. The ALQ required the subjects to rate the strength of their agreement to twenty-four statements on a five-point agreement scale. The statements were derived from Kolb *et al's* guide for analysis of personal problem solving processes (Kolb *et al.* 1979); Kolb's adaptive competencies and work abilities (Kolb 1984); Mumford's skills involved in effective learning behaviour and the rational approach to learning (Mumford 1980); Honey and Mumford's knowledge and skills items and abilities of the ideal learner (Honey and Mumford 1989); Richardson's Approaches to studying questionnaire (Richardson 1990); Smith's post project analysis form (Smith 1982) and Gibbs' abilities associated with each stage of the learning cycle (Gibbs 1988).

Analysis

Part A: descriptive statistics were calculated for each question. Part B: the forecasting data was analysed as Skitmore *et al* (1990) with a variety of summary statistics to represent bias, consistency, and accuracy (see below). Part C: Descriptive statistics were calculated for each item of the LCQ, which were then ranked based on the mean score. A three ("k") factor analysis was performed for the LCQ and factor scores generated. Additionally, a weighted average LCQ summary variable was created. The mean, standard deviation and internal consistency coefficients (using Cronbach's alpha and the Spearman-Brown split-half reliability test) were calculated for the subscale scores of Kolb's revised LSI - 1985 . A six ("k") factor analysis was performed for the ALQ and factor scores generated. The measures of bias, consistency and accuracy were then correlated, using Pearson's product moment and Spearman's rank correlation, with the 15 LCQ items, the three LCQ factor scores, the LCQ summary variable, the subscales from Kolb's revised LSI - 1985 and the factor scores of the ALQ. Additionally, these variables were then analysed for differences between subgroups based on the level of forecasting accuracy by means of one-way analysis of variance (ANOVA) and its equivalent non-parametric test the Kruskal-Wallis H test.

Summary statistics representing bias, consistency and accuracy

Thirteen summary statistics representing bias, consistency and accuracy were generated from the subjects' forecasts.

Measures representing bias: Three measures were used to represent the relationship between the forecast and the lowest bid in terms of bias:

- the raw difference between the forecast and the lowest bid (Raw Error) was calculated for each project individually and collectively. The summary statistic used to represent this measure was the arithmetic mean (RMEAN);

- the percentage difference between the forecast and lowest bid (% Raw Error) was calculated for each project individually and collectively. The summary statistic used to represent this measure was the arithmetic mean (PMEAN); and

- the difference between the log forecast and the log lowest bid (Log Raw Error) was calculated for each project individually and collectively. The summary statistic used to represent this measure was the arithmetic mean (LMEAN).

Measures representing consistency: Three measures were used to represent the relationship between the forecast and the lowest bid in terms of consistency:

- the estimated population standard deviation of the raw difference between the forecast and the lowest bid values (RSD);

- the estimated population standard deviation of the percentage difference between the forecast and lowest bid values (PSD); and

- the estimated population standard deviation of the arithmetic mean of the log forecast and log lowest bid (LSD).

Measures representing accuracy: Seven measures were used to represent the relationship between the forecast and lowest bid in terms of accuracy:

- the estimated population coefficient of variation (CV);

- the raw absolute mean or the arithmetic mean of the modulus raw errors (RABS);

- the percentage absolute mean or the arithmetic mean of the modulus percentage errors (PABS);

- the log absolute or the arithmetic mean of the differences of the log forecasts and the log lowest bids (LABS);

- the raw root mean square (RRMS);

- the percentage root mean square or the root mean square of the percentage errors (PRMS); and

- the log root mean square or the root mean square of the differences between the log forecasts and log lowest bids (LRMS).

TABLE 1: Modes, medians, means and standard deviations for the length of experience (n = 84) and RICS membership (n = 73)

	Mode	Median	Mean	SD	Kurtosis	Skewness
Generally	20	16	16.67	7.79	-0.07	0.45
Area(s) of specialism	20	12	13.03	7.20	-0.65	0.49
RICS Membership	8	16	16.69	9.02	-1.04	0.25

TABLE 2: Means and standard deviations for the number of early-stage forecasts produced in total, the last five years and last year

	Total (n = 56)		Total last 5 years (n = 75)		Total last year (n = 82)	
	Mean	SD	Mean	SD	Mean	SD
Generally	374.82	621.78	94.08	117.62	19.13	22.61
Area(s) of specialism	264.75	400.76	78.75	113.72	16.34	22.44

TABLE 3: Summary of dependent variables

Projects 1 - 3		No. of cases	Mean	Standard Error	Standard Deviation	Kurtosis	Skewness
Bias	**RMEAN**	81	30.58	14.19	127.74	0.33	0.47
	PMEAN	81	11.63	3.03	27.22	2.49	1.05
	LMEAN	81	0.06	0.03	0.23	-0.26	0.07
Consistency	**RSD**	81	105.02	5.55	49.92	0.86	1.01
	PSD	81	26.85	2.55	22.97	10.98	2.81
	LSD	81	0.23	0.02	0.14	1.00	1.11
Accuracy	**CV**	81	14.41	0.88	7.91	0.35	0.77
	RABS	81	123.25	7.97	71.77	2.61	1.54
	PABS	81	27.96	2.06	18.51	8.63	2.21
	LABS	81	0.25	0.01	0.13	0.58	0.69
	RRMS	81	141.40	8.70	78.28	2.39	1.52
	PRMS	81	33.18	2.73	24.54	13.34	2.94
	LRMS	81	0.29	0.02	0.14	1.62	0.88

TABLE 4: Means, Standard Deviations and Reliabilities for Kolb's Learning Style Inventory - 1985 revised subscales (n = 81)

	CE	RO	AC	AE	AC - CE	AE - RO
MEAN	32.43	32.86	36.82	40.49	4.39	7.63
SD	4.61	6.57	4.85	4.40	5.21	6.85
R_1	0.74	0.88	0.83	0.81	0.84	0.86
R_2	0.80	0.92	0.89	0.87	0.85	0.91

R_1 = Cronbach's Alpha, R_2 = Spearman-Brown split half

Table 5: Frequencies, means and standard deviations of individual items of the Learning Climate Questionnaire (LCQ) [n = 84]

Q		4	3	2	1	0		Median	Mean	SD
10	The organisation is an open and friendly place	**38**	31	8	6	1	There is little openness and support; the organisation is cold and insular	3	3.18	0.96
6	People manage themselves and their work; there is great emphasis on taking personal responsibility	32	**38**	12	1	1	People conform to rules and standards at all times - no personal responsibility is taken or given	3	3.18	0.81
11	Discussion of problems is actively encouraged	**34**	30	12	7	1	'People don't have problems'	3	3.06	1.00
12	High standards are a goal to be achieved	**33**	22	22	6	1	High standards are compulsory	3	2.95	1.03
4	People are usually ready to give their views and pass on information	19	**46**	15	4	0	People tend to keep their feelings to themselves; are secretive and information is hoarded	3	2.95	0.77
2	People are encouraged to learn at all times and to extend themselves and their knowledge	20	**38**	20	5	1	There is little encouragement to learn; there are low expectations of people in terms of new skills and abilities	3	2.85	0.90
8	People are very willing and supportive; pleasure is taken in the success of others	21	**35**	21	6	1	People don't support each other; there is an unwillingness to pool or share information	3	2.82	0.93
5	People are recognised for good work and rewarded for effort and learning	18	**33**	22	7	4	People's successes are ignored but blame is readily attributed	3	2.64	1.06
7	If people develop a new skill or technique there is plenty of opportunity to use it	15	30	**32**	6	1	If people develop a new skill or technique there are few opportunities to use it	3	2.62	0.90
13	Working practices and structures are constantly under review	18	**28**	25	11	2	Working practices and structures are static	3	2.58	1.04
14	Accepts that some forecasts will prove to be inadequate	10	**38**	26	8	2	Does not accept inadequate forecasts	3	2.55	0.91
15	Explicitly deals with risk and uncertainty	14	**32**	27	7	4	Avoids risk and uncertainty	3	2.54	1.02
9	Constructive feedback is often provided about your performance	7	27	**33**	15	2	Constructive feedback is rarely provided about your performance	2	2.26	0.93
3	There is a systematic process for identifying individual development needs	7	20	24	**26**	7	The identification of development needs is left to the individual	2	1.93	1.11
1	There are lots of resources; development facilities are very good	4	21	**29**	22	8	Training packages, resources and equipment are limited	2	1.89	1.04

Bold = Mode

Table 6: Correlations between Learning Climate Questions and measures of bias, consistency and accuracy (n = 81)

		RMEAN	LMEAN	RSD[1]	LSD[1]	CV[1]	RABS[1]	LABS	RRMS[1]	LRMS
10. Organisation (HS)[1]	S 'rs'	-0.172	-0.172	0.045	0.048	-0.121	-0.191	-0.174	-0.213	-0.183
6. Personal responsibility (HS)[1]	S 'rs'	0.060	0.066	0.040	0.088	-0.080	-0.093	-0.090	-0.091	-0.099
11. Problems (HS)[1]	S 'rs'	-0.159	-0.162	0.088	0.129	-0.079	-0.255*	-0.243*	-0.253*	-0.244*
12. High standards (WP)[1]	S 'rs'	-0.110	-0.092	0.058	0.098	0.007	-0.089	-0.051	-0.081	-0.056
4. People - information (HS)[1]	S 'rs'	-0.173	-0.192	0.066	0.103	-0.096	-0.086	-0.071	-0.085	-0.083
2. Encouragement to learn (SDS)[1]	S 'rs'	0.052	0.054	0.131	0.160	0.024	-0.186	-0.190	-0.190	-0.206
8. Support (HS)[1]	S 'rs'	-0.069	-0.065	0.134	0.175	-0.147	-0.085	-0.074	-0.083	-0.076
5. Recognition of work (HS)[1]	S 'rs'	-0.081	-0.071	0.248*	0.281*	-0.114	-0.073	-0.067	-0.067	-0.073
7. New skills (HS)[1]	S 'rs'	-0.095	-0.093	-0.043	-0.046	-0.187	-0.258*	-0.246*	-0.274*	-0.282*
13. Working practices (WP)[1]	S 'rs'	0.120	0.126	0.074	0.036	-0.022	-0.225*	-0.219*	-0.227*	-0.236*
14. Forecasts (WP)[1]	S 'rs'	-0.040	-0.042	0.127	0.135	-0.117	-0.190	-0.171	-0.186	-0.165
15. Risk & uncertainty (WP)[1]	S 'rs'	0.023	0.031	0.110	0.098	0.024	-0.055	-0.038	-0.044	-0.031
9. Feedback (HS)[1]	S 'rs'	0.037	0.044	0.175	0.132	-0.038	-0.085	-0.094	-0.094	-0.104
3. Identification of needs (SDS)[1]	S 'rs'	-0.150	-0.149	0.025	0.009	-0.268*	-0.093	-0.078	-0.116	-0.099
1. Resources (SDS)[1]	S 'rs'	0.179	0.179	0.029	-0.040	0.022	-0.255*	-0.280*	-0.257*	-0.291**

*** = p ≤ 0.001 ** = p ≤ 0.01 *= p ≤ 0.05

NB: [1] = Lilliefors (Kolmogrow-Smirnov) test of normality indicates that a non-parametric test is appropriate

(S 'rs' = Spearman's Correlation Coefficients)

Table 7: Correlations between Learning Climate Questionnaire summary variable and factor scores, Kolb's Learning Style Inventory subscales, Approaches to Learning Questionnaire factor scores and measures of bias, consistency and accuracy (n = 81)

		RMEAN P 'r_s'	LMEAN P 'r_s'	RSD[1] S 'r_s'	LSD[1] S 'r_s'	CV[1] S 'r_s'	RABS[1] S 'r_s'	LABS P 'r_s'	RRMS[1] S 'r_s'	LRMS P 'r_s'
Learning Climate										
LCQ Summary Variable	P 'r_s'	-0.041	-0.024	0.124	0.109	-0.135	-0.271*	-0.224*	-0.281*	-0.221*
Human Support	P 'r_s'	-0.092	-0.081	0.143	0.181	-0.119	-0.196	-0.190	-0.197	-0.172
Working Practices	P 'r_s'	-0.027	-0.008	0.144	0.145	-0.084	-0.220*	-0.193	-0.222*	-0.180
Development Systems	P 'r_s'	-0.022	-0.010	0.048	0.008	-0.137	-0.238*	-0.174	-0.255*	-0.191
Learning Style										
Concrete Experience [1]	S 'r_s'	-0.048	-0.047	0.134	0.167	0.017	0.060	0.061	0.064	0.063
Reflective Observation	P 'r_s'	0.077	0.055	0.059	0.027	-0.037	0.222*	0.291**	0.201	0.285**
Abstract Conceptualisation	P 'r_s'	-0.170	-0.186	0.114	0.166	0.033	0.138	0.225*	0.154	0.241*
Active Experimentation [1]	S 'r_s'	-0.088	-0.095	0.126	0.170	-0.096	0.098	0.152	0.092	0.134
AC_CE	P 'r_s'	-0.084	-0.097	0.061	0.072	0.061	0.117	0.180	0.132	0.180
AE_RO	P 'r_s'	-0.137	-0.125	-0.005	0.063	0.007	-0.159	-0.144	-0.138	-0.147
Approach to Learning										
Risk-taker	P 'r_s'	-0.227*	-0.245*	0.124	0.176	0.106	0.167	0.166	0.163	0.170
Self-management [1]	S 'r_s'	-0.035	-0.038	0.147	0.142	0.095	0.155	0.187	0.141	0.162
Proactivity	P 'r_s'	0.063	0.063	0.213	0.189	0.194	0.146	0.149	0.176	0.175
Insecurity	P 'r_s'	0.060	0.033	0.286**	0.284**	-0.077	0.098	0.097	0.146	0.142
Passivity	P 'r_s'	-0.011	-0.012	0.150	0.122	0.058	-0.097	-0.046	-0.060	-0.015
Self-confidence	P 'r_s'	-0.023	-0.034	0.310**	0.373***	-0.028	0.150	0.160	0.168	0.192

*** = p ≤ 0.001 ** = p ≤ 0.01 * = p ≤ 0.05

NB: [1] = Lilliefors (Kolmogrow-Smirnov) test of normality indicates that a non-parametric test is appropriate

(P 'r' = Pearson's Correlation Coefficients , S 'r_s' = Spearman's Correlation Coefficients)