RESEARCH MODEL FOR EVALUATING THE IMPACT OF TECHNOLOGY IN WORKPLACE DESIGN IN AUSTRALIA

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Abstract: This paper discusses the importance of the research epistemological and ontological position, which together with the adopted theoretical perspective, define the methodology and methods used by the study. The research approach not only shapes the research instrument and the interpretation of the results obtained by it, but sets all the assumptions and constraints adopted by the researcher about reality and knowledge that determine the type of conclusions that the study can arrive. The arguments here developed are based on academic readings and initial results from a pilot study designed for a PhD set to investigate the effects of technology in workplace architecture in Australia. The study proposes a provocative research paradigm that departs from traditional models in order to best understand the complex *reality* of workplace architecture. The pilot's reliability is tested and conclusions presented based on the adopted research approach.

Keywords: Data analysis, reliability, research design, workplace architecture.

1. INTRODUCTION

Like its predecessors, the current technology revolution – the information revolution – has created an irreversible historical discontinuity that has transformed our society. Work continues to be at the core of the social structure, but its foundations are changing. Technology is revolutionising where we work, how we work, when we work and even in what we work (Becker and Steele 1994; Castells 1996; Linturi 2000; Marmot and Eley 2000). With so many options available to host new working paradigms – teleworking, hot-desking, virtual office, cottaging, caves, etc. – the future of workplace architecture, the design of space where work is carried out, is uncertain.

It is expected that the findings of the research "*Evolution of Workplace Architecture as a Consequence of Technology Development*", from which this paper is extracted, will provide information on today's complex office environment that will help forecast tomorrow's workplace architecture. This paper discusses the research design used in such research.

The research is based on two *Grand-tour* questions – the broadest questions that can be asked so as not to limit the inquiry (Creswell 1994) – a) *to what extent is information technology changing workplace architecture?* and b) h*ow is information technology changing workplace architecture?* Based on Maxwell (1996) question *'a'* is a variance question because it focuses on differences and correlations and tries to establish whether there is a particular relationship between technology changes and workplace

architecture. On the other hand, question '*b*' is a process question since it focuses on '*how*' things happen. The focal point of process questions is not in explaining a difference in terms of some independent variables – e.g. cause and effect –, but in understanding how the phenomenon develops. As a consequence, each grand-tour question – together with its sub-questions – follows different approaches.

This paper has three sections. The first section presents a provocative research paradigm proposed to understand the complex *reality* of workplace architecture. The second part reviews the adopted conceptual model for evaluating work environments. Finally, the outcome of the pilot study provides practical information to assess the reliability of the research instrument.

2. THE RESEARCH APPROACH

"The assumptions we make about human knowledge and assumptions about realities encountered in our human world, will impact the meaning of research questions, the purposiveness of research methodologies, and the interpretability of research findings." (Crotty 1998)

2.1 Epistemology and ontology

The justification of the use of a particular methodology depends on the research's assumption about reality (Crotty 1998). Epistemology is the relationship between the reality, ontology, and the researcher (Sobh, 2006). Epistemology is a way of understanding and explaining how we know what we know. It deals with the "*the nature of knowledge, its possibility, scope and general basis*" (Hamlyn 1995) "*and is concerned with providing a philosophical grounding for deciding what kinds of knowledge are possible and how we can ensure that they are both adequate and legitimate*" (Maynard 1994).

There are three main epistemological positions: objectivism, constructivism and subjectivism. Objectivism sustains that things exist as meaningful entities independently of consciousness and experiences. That is, truth and meaning reside in the objects. Thus, meaningful reality exists as such apart from any consciousness. Under this epistemological point of view, the objective truth can be exposed because understandings and values are objectified in the people being studied. On the other hand, constructionism sustains that the subject and object emerge together in the generation of meaning, which is a consequence of the mind and cannot exist without it. Under this epistemological position meaning is not discovered, but constructed. There is no objective truth to be discovered. Finally subjectivism, a variant of constructionism, sustains that meaning is imposed into the object by the subject rather than coming out of '*interplay*' between subject and object as in constructivism. In subjectivism the object does not contribute at all to its meaning (Crotty 1998).

As further discussed in section *3 Evaluating Workplace Environments* an individual's perception of a specific workplace environment is dependent on but distinct from the objective environmental attribute itself. That is, different people will perceive differently the same working environment and thus construct different meanings of the same phenomenon. Therefore, the epistemological position for this research is constructivism. Because of this, the research cannot unveil an objective truth

independent to any consciousness – positivism –. Instead, it explores the humanly fashioned way of seeing things (Crotty 1998).

Parallel to epistemology is ontology. Ontology is the study of '*being*', of the '*what is*' with the nature of existence. This research adopts realism – reality exists outside the mind – as its ontology because it shares the principle that the world and things in it exist independently of our consciousness of them. Computers, desk, phones and the office building itself exist whether we are conscious of them or not.

However, this approach clashes with the traditional link between objectivism in epistemology and realism in ontology and that ontology in constructivism is defined by multiple local and specific "*constructed*" realities (Creswell 1994; Crotty 1998; Perry et al. 1999). Nevertheless, Crotty (1998) challenges such traditional posture and notes that "*realism in ontology and constructionism in epistemology turn out to be quite compatible*". Whilst he agrees that there is a world independent of the consciousness: "*the world is there regardless of whether human beings are conscious of it*", he sustains that the world only becomes a world of meaning when meaning-making begins to make sense of it. Existence of a world without a mind is conceivable. Meaning without a mind is not. Therefore, it is possible for this research to adopt realism in ontology and still be compatible with its constructionism epistemology.

2.2 Theoretical perspective

The theoretical perspective is the philosophical stance laying behind the methodology and providing a context for the process as well as grounding its logic and criteria. It is an approach to understand and explain society and the human world. As a consequence, the adopted theoretical perspective will generate a number of assumptions that will impact in the methodology (Crotty 1998).

Given that work is a consequence of our culture (Castells 1996) the most suitable theoretical perspective for the research is interpretivism. Interpretivism looks for culturally derived and historically situated interpretations of the social life-world (Schwandt 1994; Crotty 1998).

From the three branches of interpretivism: hermeneutics, phenomenology and symbolic interactionism, it is the latter that best suits the research approach. Symbolic interactionism has three main assumptions as defined by Blumer (1969): a) human beings act toward things on the basis of the meanings that these things have to them; b) the meaning of such things is derived from, and arises out of, the social interaction that one has with one's fellows; and c) these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he or she encounters.

2.3 Methodology and Methods

Methodology is the strategy behind the choice of particular methods. The methodology inherits all the assumptions established in the epistemology, ontology and theoretical perspective as previously discussed (Crotty 1998).

It is important to note that the distinction between qualitative and quantitative research occurs at the level of methods, not at the level of epistemology or theoretical perspective. This model challenges the widely spread conception that objectivist

research must use quantitative methods whilst subjectivist research must limit to qualitative methods. Quantification is by no means ruled out within non-positivist research (Crotty 1998).

The methodology of the research is survey. A survey provides a numeric description of some fraction of the population, known as the sample, through the data collection process of asking questions to people in such a way that allows the researcher to generalise the findings to the population (Creswell 1994; Fowler 2002).

Due to the costs and impracticality of collecting information from everyone in a group, data from only some people reflecting the characteristics of such group is more efficient than surveying all members of the group (Vaus 1995). Paradoxically, sample surveys are often more accurate than interviewing every member of the population. The reasons for this paradox are a) the quality of the data collected in a large survey is usually lower than the one obtained in a smaller one and b) a large population requires a long interviewing period which makes impossible to specify the time to which the data refer to (Babbie 1990; Fowler 2002). However, the highest risk in survey samples is that the selected sample misrepresents the population from which it belongs (Babbie 1990).

Stratified sampling, a variant of Simple Random Sampling (SRS), uses a homogeneous population which produces samples with smaller sampling errors than a heterogeneous population (Vaus 1995). This is achieved by organising the population into homogeneous subsets – with heterogeneity between subsets – and selecting the appropriate number of elements from each subset (Babbie 1990).

3 EVALUATING WORKPLACE ENVIRONMENTS

Back in the 1980 that office technology started to change rapidly, the issue of performance on the job and how it is affected by the physical environment attracted the attention of corporate executives and space planners. Earlier studies support the debate that the design of the workplace can serve to impede job performance (Allen and Gerstbeger 1975; Harris 1978) and enhance the satisfaction of workers on the job (Lunden 1972) in Marans and Spreckelmeyer 1982.

A number of environmental researcher and designers have sought to isolate relationships between specific attributes of the workplace on the one hand, and satisfaction and performance on the other (Marans and Spreckelmeyer 1982). Several have done so within the framework of empirically based post occupancy evaluations. However, Marans and Spreckelmeyer (1982) note that one of the failures of post-occupancy methods is the lack of a carefully developed conceptual link between physical environmental attributes and various levels of worker responses to those attributes.

In their conceptual model, Marans and Spreckelmeyer acknowledge that an individual's perception of a particular attribute is dependent on but distinct from the objective environmental attribute itself. Further, the characteristics of an individual are seen as affecting his or her perceptions and assessments of environmental attributes and the standard for comparisons that are used. These two principles are not only consistent with, but fundamental for the adopted epistemology, ontology and theoretical perspective as previously discussed.

The core of the model, refer to figure 1, is represented by the direct and indirect links between objective environmental attributes, people's subjective responses to these attributes, overall environmental satisfaction, and specific behaviour or sets of behaviours.

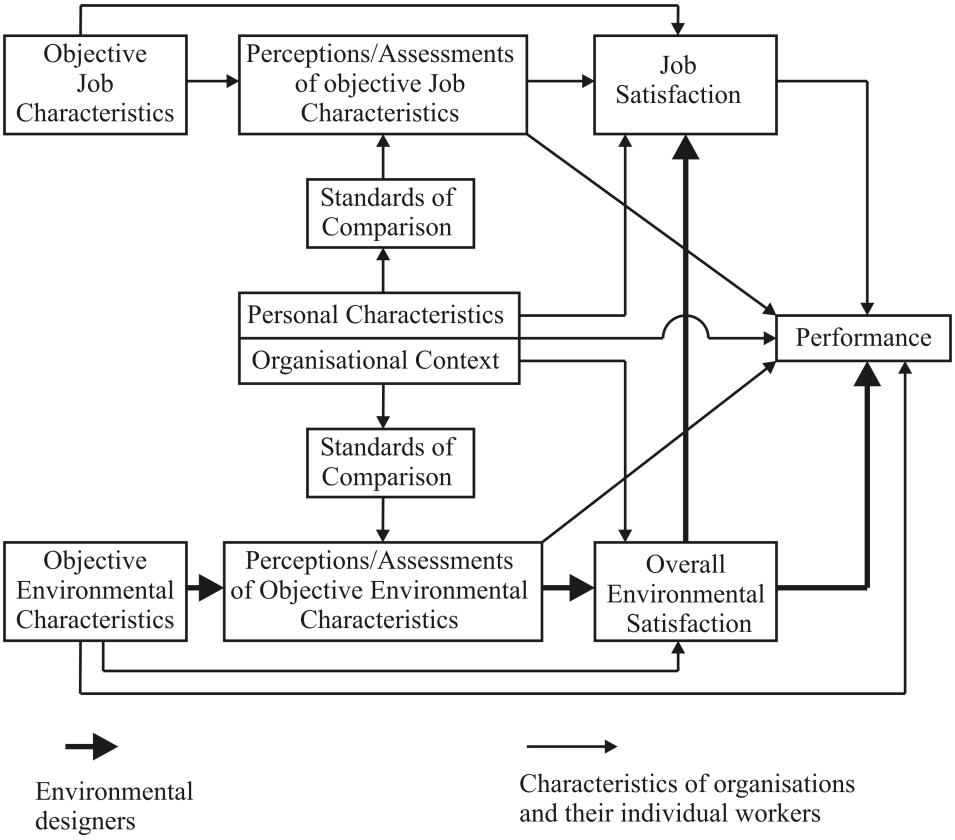

Figure 1: Conceptual model for evaluating work environments. (Based on Marans and Spreckelmeyer 1982)

Although this model considers three aspects: 1) overall environmental satisfaction, 2) job satisfaction, and 3) worker performance, it is the former – overall environmental satisfaction – the outcome of greatest interest to architect and most relevant to the research. Overall environmental satisfaction for an employee is dependant upon four factors: the characteristics of the employee, including his or her position or job type; the organisational context in which employees operate, the activities that take place within it, employee/employer relations, etc.; the individual's perceptions and assessments of various specific attributes; and the objective attributes themselves.

4 THE PILOT

The pilot package, which included a cover letter, research instrument, and feed-back form, was sent to a convenience sample – no sampling was used at this stage – on Monday 14th of August 2006 to 31 potential respondents of seven different companies.

On the first week 35 per cent of all sent questionnaires were received. By the following week 42 percent and by the third week 58 per cent of all sent questionnaires and 81 per

cent of all received questionnaires were received. The last questionnaire was received on week nine. No time limit was established to end the recollection of questionnaires.

Table 1 shows how many packages were sent to each group and how many were returned.

Table 1: Sent vs. returned pilot packages.

	Sent packages	**Returned questionnaires**
Group A	10	8 (80%)
Group B	3	3 (100%)
Group C	8	5 (63%)
Group D	7	4 (57%)
Individual	3	2 (66%)
Total	**31**	**22 (71%)**

The main objective of a pilot test is to prevent the research instrument from not meeting its objectives due to unforseen errors (Babbie 1990). Some indicators tested in this pilot were response rate – as previously discussed –, suitability of the questions, and overall questionnaire design. However, this paper focuses on reliability because it is a fundamental aspect that more often than not is overlooked during the pilot stage. Moreover, through its analysis not only is the research instrument tested, but the whole research approach.

4.1 Reliability

A question is reliable when two respondents that are in the same situation answer it in the same way. Otherwise, random error is introduced making the measurement less precise (Fowler 2002). The following design guidelines as proposed by Babbie (1990), Fowler (2002) and Bradburn, Sudman et al (2004) for self-administered questionnaires were adopted in the design of the questionnaire to increase its reliability.

- Standardised instrument: Survey research makes the necessary assumption that differences in answers derive from differences amongst respondents, rather than from differences in the stimuli to which respondents are exposed. In order to best measure the former over the latter, the questionnaire was designed so that all questions meant the same to all respondents. Otherwise, two respondents could provide different answers to the same question just because they understand it differently.
- Sensible questioning: Respondents are asked only questions they are likely to know the answer to, and that are relevant to them.
- Single questions: When respondents are faced with two questions in the same sentence, they need to decide which to answer. Because such decision is made inconsistently by different respondents, the questionnaire becomes unreliable.
- Simple and short: If there is the possibility for the respondents to get confused about what they are supposed to do, they will be. Checking a box is the only task required in the questionnaire. Parallel, long surveys result in poor response rates,

careless answers, and useless results. The quantity and quality of questions asked is strictly limited to the information required. "*Wouldn't it be interesting to know*" questions were avoided.

5 RESULTS

In this paper the results of the pilot are only interpreted and analysed to test the reliability of the research instrument and to assess the suitability of the research paradigm. Table 2 shows the results of the pilot by group.

Table 2: Reliability assessment of research instrument.

		FREQUENCY TABLE																				SCORE BY GROUP				SUBJECTIVE	OBJECTIVE
		GROUP A Count 8					GROUP B Count 3					GROUP C Count 5					GROUP D Count 4					GRP A	GRP B	GRP C	GRP D		
		1	2	3	4	5-9	1	2	3	4	5-9	1	2	3	4	5-9	1	2	3	4	5-9						
SUBJECTIVE PERCEPTION	1.A	1	-	6	1		-	-	3	-		1	-	2	-		-	1	3	-		2	2	2	2	2	
	1.B	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		1	4	1	2	2	
	1.C	8	-	-	-		2	1	-	-		5	-	-	-		2	2	-	-		1	3	2	1	1.75	
	1.D	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		3	0	1	0	1	
	1.E	-	8	-	-		1	2	-	-		4	1	-	-		-	4	-	-		1	2	2	1	1.5	
	1.F	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		0	2	0	2	1	
	1.G	1	-	4	3		-	-	3	-		1	2	2	-		-	3	1	-		2	3	0	2	1.75	
	1.H	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		3	4	3	1	2.75	
	1.I	-	2	6	-		-	2	1	-		-	2	3	-		2	2	-	-		3	2	0	1	1.5	
	1.J	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		3	2	1	1	1.75	
	1.K	7	-	1	-		2	1	-	-		5	-	-	-		3	1	-	-		0	0	0	3	0.75	
	1.L	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		1	4	0	1	1.5	
	1.M	-	2	5	1		-	1	1	-		-	1	4	-		2	1	-	-		1	0	1	3	1.25	
	1.N	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		2	0	0	3	1.25	
OBJTV.	3	-	3	5			-	1	2	-		1	1	2	-		-	1	3	-		2	4	4	4		3.5
	4	-	-				-	-				-	-				-	-				4	4	2	2		3
	5	-	-	-			-	-	-	-		-	-	-	-		-	-	-	-		1	4	3	4		3
	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	1	4		2.75
☺	7	-	-	-			-	-	-			-	-	-			-	-	-			3	4	3	3	3.25	
OBJECTIVE DESCRIPTION	9	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		0	3	3	3		2.25
	10	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		0	3	2	4		2.25
	11	-	-				-	-				-	-				-	-				4	4	4	4		4
	14	-	-				-	-				-	-				-	-				4	1	4	0		2.25
	15	2	1				-	-				-	-				1	1				4	1	2	4		2.75
	16	-	-	1	-		1	1	-	-		-	-	-	-		-	-	-	-		0	4	1	3		2
	17	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		3	3	2	2		2.5
	18	-	-				-	-				-	-				-	-				4		4	3		2.75
	19	-	-				-	-				-	-				-	-				1	1	0	4		1.5
	20.A	-	-	-			-	-	-			-	-	-			-	-	-			2	4	1	3		2.5
	20.B	-	-	-			-	-	-			-	-	-			-	-	-			1	4	1	3		2.25
	20.C	-	-	-			-	-	-			-	-	-			-	-	-			2	0	1	3		1.5
	20.D	-	-	-			-	-	-			-	-	-			-	-	-			2	3	1	3		2.25
	20.E	-	-	-			-	-	-			-	-	-			-	-	-			3	4	0	3		2.5
	21	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		3	4	1	4		3
☺	22	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-		0	4	1	2	1.75	
																						1.97	2.57	1.54	2.51		

The first columns on the right (1.A, 1.B, etc.) are the ID of the questions asked. The actual questions are not relevant for this paper – although further analysis provide more information for questions 1.A to 1.N. –. Subjective questions refer to assessments of objective environmental characteristics like temperature, ventilation, illumination, etc. On the other hand, objective questions provide information about objective attributes of the respondent workplace like type of building, Internet connection and so on. The following four columns of table 2 show how many respondents provided a specific

response by group – frequency table –. Next set of four columns is the score assigned to each question by group. This score is an indicator of how homogenous is the response. A perfectly homogenous question, that in which all respondents provided the same answer, scores '4'. A completely heterogenous question, that in which there is no consensus between answers, scores '0'. The scores were calculated taking into account descriptive statistics indicators such as standard error, standard deviation, sample variance, skewness and range. The last two columns show the reliability score, which is the average of the score by group.

The average score of subjective questions is 1.67, the average score of objective questions is 2.55. As expected, objective questions are more reliable than subjective questions. However, further analysis indicates that whilst the assessment of the environment varied considerably between respondents, there is a relationship in the way such assessment is done.

Figure 2 is a scattergram that plots the score given to question 1N: overall satisfaction of the space environment at the workplace (Y axis) vs each of the individual factors that contribute to the overall satisfaction – temperature, ventilation, etc. – (X axis). Regression lines are added for analysis.

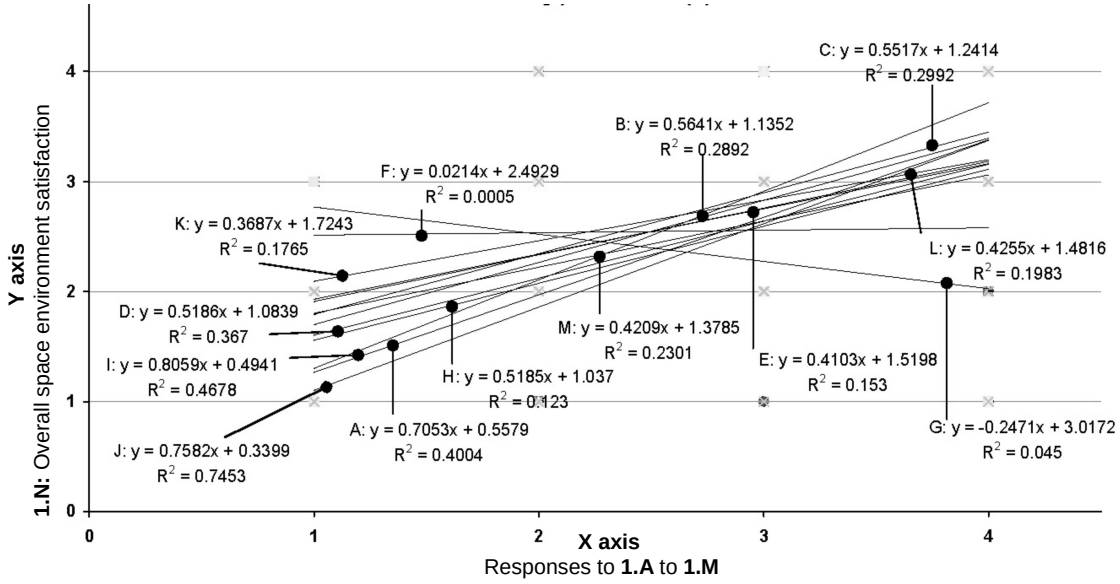

Figure 2: Overall satisfaction vs. individual environment parameters

The regression line predicts *Y* scores of individuals given knowledge of *X* scores and estimates the strength of association between *X* and *Y*. The impact of *X* on *Y* is given by the slope (m) of the linear equation. Therefore, the higher R2 value is, the higher the accuracy of predictability and the higher the slope (m) the higher the impact of *X* on *Y* (Vaus 1995).

Table 3 sorts the individual parameters by its predictability accuracy (R2) and impact (m). It is noted that the three most predictable parameters are also the ones that have the highest impact. With the exception of 1.G and 1.F, which also score the lowest predictability and impact, the trendlines suggest a directly proportional relationship between the overall satisfaction and the individual variables. This implies that whilst there is no consensus between respondents in assessing subjective parameters – as previously shown in table 1 –, there is consistency in the way the variable is assessed.

Table 3: Trend line analysis

		R2				m
1.J	**General office size**	**0.7453**		**1.I**	**General furniture arrangement**	**0.8059**
1.I	**General furniture arrangement**	**0.4678**		**1.J**	**General office size**	**0.7582**
1.A	**Temperature comfort**	**0.4004**	→	**1.A**	**Temperature comfort**	**0.7053**
1.D	Background noise level	0.367		1.B	Ventilation comfort	0.5641
1.C	Illumination comfort	0.2992	→	1.C	Illumination comfort	0.5517
1.B	Ventilation comfort	0.2892		1.D	Background noise level	0.5186
1.M	Work space available on workstation	0.2301		1.H	General office distribution	0.5185
1.L	Individual storage space	0.1983	→	1.L	Individual storage space	0.4255
1.K	General office storage space	0.1765		1.M	Work space available on workstation	0.4209
1.E	Frequency of distractions	0.153	→	1.E	Frequency of distractions	0.4103
1.H	General office distribution	0.123		1.K	General office storage space	0.3687
1.G	Voice privacy at your workstation	0.045	→	1.G	Voice privacy at your workstation	-0.2471
1.F	Visual privacy at your workstation	0.0005	→	1.F	Visual privacy at your workstation	0.0214

This constant relationship in which the variables are assessed is further corroborated by using a correlation matrix. A correlation matrix shows the level of relationship between all pair of variables. Variables with a correlation index of '0' denote no relationship between them, on the other hand, variables with a perfect relationship have a correlation index of '1'. A positive relationship means that respondents who provided a high score on one variable tended to obtain a high score on the other variable. A negative relationship means that those who obtained a high score on one tended to obtain a low score on the other.

In table 4, the mirror image of the correlation table produced above the diagonal where the variable intersects with itself has been substituted by the correlation of random numbers. These random numbers were generated using the same range (1-4) and the same sample size (22) of the pilot study. The adjacent frequency table groups the correlations in five ranges. This table shows that the pilot correlation index exceeds that of the random sample.

Table 4: Correlation matrix: Pilot vs. Random

	RANDOM														
1.A	**1.A**	-0.11	0.01	0.28	-0.46	0.00	-0.10	-0.26	-0.16	-0.24	0.05	0.09	-0.30	0.31	**1.A**
1.B	**0.49**	**1.B**	0.06	0.02	-0.01	-0.03	-0.13	0.40	-0.03	-0.03	0.10	-0.20	-0.24	-0.22	**1.B**
1.C	0.65	0.49	**1.C**	-0.31	-0.11	-0.17	-0.21	0.33	0.08	0.02	0.07	-0.29	-0.02	0.18	**1.C**
1.D	0.55	0.50	0.34	**1.D**	-0.26	0.12	0.15	-0.22	0.10	0.16	-0.18	0.10	-0.11	-0.09	**1.D**
1.E	0.60	0.18	0.64	**0.50**	**1.E**	-0.02	0.16	-0.07	0.14	0.01	0.08	-0.25	0.11	-0.30	**1.E**
1.F	0.42	0.36	0.19	0.32	0.31	**1.F**	0.20	-0.16	-0.03	-0.10	0.19	-0.19	0.10	0.31	**1.F**
1.G	0.10	0.17	0.04	0.03	0.28	**0.69**	**1.G**	-0.23	0.10	0.23	0.15	0.13	0.34	-0.04	**1.G**
1.H	**0.36**	**0.22**	0.33	0.21	0.51	0.12	0.07	**1.H**	0.03	0.10	-0.10	-0.14	-0.38	0.02	**1.H**
1.I	0.68	0.35	0.42	0.48	0.46	0.18	-0.12	**0.58**	**1.I**	-0.33	0.14	-0.32	0.03	-0.12	**1.I**
1.J	**0.67**	0.52	0.65	0.58	0.43	0.07	-0.29	**0.35**	**0.78**	**1.J**	-0.33	0.29	-0.01	-0.14	**1.J**
1.K	0.63	0.28	0.54	0.21	0.49	0.18	0.02	0.39	0.59	**0.48**	**1.K**	-0.17	0.15	-0.23	**1.K**
1.L	0.60	0.26	0.63	0.11	0.44	0.33	0.10	0.40	0.37	0.43	**0.76**	**1.L**	0.04	0.07	**1.L**
1.M	0.55	0.24	0.28	0.18	0.28	0.31	0.03	0.15	0.42	0.38	0.65	**0.68**	**1.M**	-0.12	**1.M**
1.N	**0.63**	**0.54**	**0.55**	**0.61**	**0.39**	**0.02**	**-0.21**	**0.35**	**0.68**	**0.86**	**0.42**	**0.45**	**0.48**	**1.N**	**1.N**
	PILOT														

Frequency Table

	RANDOM		PILOT	
0.76-1.00	0	0%	3	3%
0.51-0.75	0	0%	25	27%
0.26-0.50	16	18%	39	43%
0.10-0.25	48	53%	17	19%
0.00-0.09	27	30%	7	8%
	91	**100%**	**91**	**100%**

However, not all correlations are relevant. As per Vaus (1995), variables can be related but not causally related, called a spurious relationship. For example correlation 1.B (ventilation comfort) with 1.L (individual storage) is a spurious relationship. Nevertheless, the correlation values – higher than the random results – indicate a tendency in the way the variables were assessed. Only bolded correlations are non spurious relationships.

As per the trend line analysis, this suggests that even though the parameters are considered to be subjective, they denote a correlation between them considerably higher than the random generated responses.

6 CONCLUSIONS

The results from the pilot are compatible with the research paradigm in that they suggest that workplace environments are subjectively interpreted to construct several realities of a single environment. However, these subjective realities are not randomly created. They denote consistency and are constructed from a common reality.

The idea that appropriate methods will unveil an objective truth is staring to shift by the view that "*all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context*" (Crotty 1998).

This paper also shows how quantitative methods can effectively be used to analyse a non positivist research.

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