
Available from Deakin Research Online:

http://hdl.handle.net/10536/DRO/DU:30019956

Every reasonable effort has been made to ensure that permission has been obtained for items included in Deakin Research Online. If you believe that your rights have been infringed by this repository, please contact drosupport@deakin.edu.au

Copyright: 2009, AUBEA
JOB SATISFACTION VERSUS OFFICE ENVIRONMENT: 
INFLUENCES ON ACADEMIC KNOWLEDGE WORKER 
PRODUCTIVITY
Hilary A Davies
School of Architecture and Building, Deakin University, Victoria, Australia
hilary.davies@deakin.edu.au

ABSTRACT
This research paper provides a more encompassing review of self-assessment of a variety of knowledge worker activities, as well as providing the basis for these self assessments. A novel aspect is the inclusion of motivational affects which are considered alongside work environment influences on productivity. A questionnaire was administered on 25 academics. The group was questioned for their perceptions of their productivity for a range of their everyday activities and what areas of their work environment enhanced or disrupted their productivity. Job satisfaction was also assessed. The results from a series of self-assessments show that on the whole, the sample perceive themselves to be reasonably to very productive in all tasks undertaken. Staff satisfaction measures are generally very positive with collaboration and job enjoyment being motivational factors for this group. Noise levels, thermal conditions, poor lighting and a lack of storage seem to be the biggest inhibitors of productivity. Having a window to look out of and access to natural light seem to enhance an academics view of their productivity.

Keywords
Academic knowledge workers; productivity; work settings; work environment; job satisfaction

INTRODUCTION
Worker productivity is a very important issue for organisations in today’s service-dominated business world. It is important for facilities managers to be aware of the complex interaction of factors that influence an employee’s productivity (Davies 2005). These range from the physical environment itself, to the psychological
factors that affect worker commitment and motivation. The physical factors include
the provision of a comfortable working environment and appropriate facilities to
support productivity. The relationships with colleagues and managers at work can
also impact a worker’s efficiency and effectiveness. Highly effective teams can
generate the new ideas that produce innovations in the market, whilst relationships
with managers can influence motivation – feeling appreciated and recognised for
work done can generate increased productivity, or the converse.

Assessment of knowledge worker productivity has proved elusive. How is it
possible to measure creativity, innovation, increased collaboration or those other
outputs that add value to an organisation? Derivative measures include health-
related workplace measurements such as absenteeism, presenteeism, and employee
turnover/replacement costs (Loeppke et al 2003) or some means of self-assessed
productivity, sometimes validated with supervisor or manager confirming reports
(Leaman and Bordass 1999). Knowledge worker work-styles are also highly varied
– although there is some commonality with tasks that involve collaboration,
communication, quiet concentrated work, and for some organisations, laboratory
work. In providing a breakdown of day-to-day activities, this paper attempts to
establish how productive a sample of knowledge workers are in a range of activities.

The questionnaire developed for this research addressed sets of factors from three
areas: physical, physiological and psychological factors. The physical factors
addressed the physical attributes of the internal working environment itself (for
example appearance, space, facilities and office layout), the physiological factors
focused on the work environment comfort, air quality and ventilation, and noise;
while the psychological factors look at the psychological state of the employee - that
is how their mood and job satisfaction affect their productivity. In addressing these
factors the questionnaire also attempted to assess how productive knowledge
workers are in their different tasks at work.

The aim of this research paper is therefore to analyse the productivity of academics
(as representatives of knowledge workers) when undertaking a variety of activities
and also to establish the basis for these knowledge workers’ self-assessments of their
productivity. This research paper also identifies those aspects of the workspace that
either hinder or enhance academic productivity. The results of the questionnaire are
presented followed by a discussion section.
Knowledge workers: Who are they and what do they do?

Knowledge workers are growing in numbers and becoming increasingly important to businesses. It is likely that at least 75% of office workers are in fact knowledge workers (Steelcase 2000). What they do, creates value for an organisation.

The term ‘Knowledge Worker’ can be used to define employees in a wide range of industries and sectors such as education, banking and finance, legal and health sectors. Western Management Consultants (2002) see a knowledge worker as someone who is:

- “A problem solver versus a production worker;
- A person who uses intellectual rather than manual skills to earn a living;
- An individual who requires a high level of autonomy;
- A manipulator of symbols; someone paid for quality of judgement rather than speed of work;
- Someone who possesses un-codified knowledge which is difficult to duplicate;
- Someone who uses knowledge and information to add to deeper knowledge and information”.

Western Management Consultants (2002), [http://www.wmc.ca/bs_home.html](http://www.wmc.ca/bs_home.html)

According to Steelcase (2000) knowledge workers use information as the raw material that they then process, analyse and interpret. They add value by generating new information, formulating and solving new problems. Drucker (1998) sees a knowledge worker as someone who knows more about what they are doing than anyone else within the organisation. They are motivated by the job itself, the challenge and the learning opportunities offered by the job (Drucker, 1998).

Academics as representatives of knowledge work

Academics undertake a wide range of tasks that require information creation and new knowledge generation (research and writing, collaborative research), knowledge acquisition (reading and researching existing information), reformulation and representation of information (teaching preparation), mentoring and coaching.
activities with students individually and in groups, as well as a number of relatively routine tasks (assessment, e-mailing) and participation in meetings. They ably fit the descriptions of knowledge worker activities.

**Measuring knowledge worker productivity**

How do you measure the productivity of office workers, particularly that of knowledge workers? Unlike manual labour or production line manufacturing, tangible measurable outputs from knowledge work are not obvious, making it difficult to measure (Kaplan and Aronoff, 1996). Leaman (1995) acknowledges that self-assessment of knowledge work has issues of reliability and representativeness but remains the most used practical means of measuring output. Most knowledge work tasks defy some form of work-study measured analysis of output. Because of this lack of measurement, Drucker (1999) believes knowledge worker productivity has not improved over at least the last 100 to 200 years. Therefore the need for a way in which to understand the tasks and measure productivity is becoming increasingly important.

At its most simplistic, the term productivity can be used to identity the relationship between inputs and outputs. This type of definition may be used to measure the productivity in a factory, manufacturing plant or on a building site; it is however of no use when measuring knowledge work. The most important thing that distinguishes knowledge work from manual work is a concentration on quality rather than simply output quantity (Leifer 2002). Effectiveness, rather than efficiency is what matters (Duffy and Tanis, 1993). Effectiveness is about producing the right work ie the best quality with potential to add value or increase knowledge.

Knowledge worker productivity can be measured at two levels; the organisational level and the individual level. Ultimately the individual performance of the knowledge worker will influence the overall performance of the organisation. Therefore, for the purpose of this research paper, productivity will focus on the individual level.
METHODOLOGY

A questionnaire was developed covering the 3 aspects considered to affect productivity: physical, physiological and psychological together with general background information about the participant. The respondents were able to respond anonymously, but a coding system was employed to allow tracking and checking of completed questionnaires. The code was then removed.

In attempting to quantify the productivity of academics, the main tasks that academics undertake on a regular basis were targeted. Initial discussions with a small group of academics resulted in the following areas of work being selected: working with students, reading / researching, collaborative research, new ideas / innovation, writing, teaching preparation / subject development, reflection on teaching practices, grading / marking students work, emailing and attending meetings. The questionnaire addressed these activities.

Respondents were also asked to comment on their perceived level of productivity and those features of their work environment that either make it easier or harder to perform the required work. Their motivation in the job was assessed using the “Job Satisfaction Survey” created by the Wellness Council of America (WELCOA) (2004) which asks a series of questions relating to values fit with organisational values, knowing work expectations, relationships with superiors and colleagues, autonomy and independence and feeling valued and recognised for work done and being suitably financially rewarded.

The sample size precluded any in-depth statistical analysis, however, the spread of the responses illustrates trends in job satisfaction, work environment and self-assessed productivity.

RESULTS

Twenty five respondents completed the survey representing a response rate of 83%. Of the 25 respondents 84% were male and 16% female. The respondents were predominantly in the age band 25-40 (48%), 44% aged between 41 and 60, with one participant aged above 60 years and one below 25 years.
Self assessment of productivity whilst undertaking knowledge worker activities

The participants were then presented with a list of predetermined activities and asked to rate how productive they felt they were with each activity.

The majority of respondents (18 or 72%) feel they are productive when working with students (Figure 1), with 20% of these (5 staff) feeling they are highly productive. Three staff employed as researchers indicated that they are not productive. The modal response was 6 on the 7-point scale, which suggests a more productive bias. However with a coefficient of variance of 62%, there is not an overwhelming trend.

![Figure 1 Self-assessment of productivity working with students](image1)

When asked to comment on their level of productivity when reading / researching information, Figure 2 shows that participants’ modal response was the neutral point on the scale with a near normal distribution of responses.

![Figure 2 Self-assessment of productivity in reading / researching information](image2)
When asked to comment on how productive they are in collaborative research, Figure 3 shows that 55% of participants indicated they are productive in this type of activity. The coefficient of variance of 41% suggests a weak trend towards greater productivity.

![Collaborative research](image)

Figure 3   Self-assessment of collaborative research productivity

When assessing how productive they are in undertaking new ideas / brainstorming, 50% of the respondents indicated that they are productive, with 10% also indicating that they are very productive. Of 22 participants who responded to this question, Figure 4 shows that 23% also indicated they were unsure, and therefore indicated a neutral response.

![New ideas/brainstorming](image)

Figure 4   Self-assessment of new ideas / brainstorming productivity

When determining the extent to which an academic is productive in the activity of writing, Figure 5 displays a mean result for the data as being 3.48, indicating that the general response was more positive, with 44% of those indicating being productive and a further 8% indicating feelings of high productivity.
When undertaking teaching preparation / subject development, the modal response was 6 on the 7-point scale. Figure 6 shows that 63% of those respondents indicated being productive, with 16% being very productive.

Productivity in grading/marking (Figure 7) shows that 73% of staff feel they are on the positive side of productivity when grading or marking.
When asked to comment on their level of productivity when emailing, (Figure 8), of those participants who responded, 27% indicated that they were unproductive and 32% indicated that they were productive.

When asked the question of how productive the participants were in attending meetings, the results in Figure 9 show that on average respondents indicated that they are unproductive, with the mean result being 3.2. Of those that responded to the question, 30% also indicated that they are very unproductive.
Work preference and performance

Participants were asked to comment on whether they preferred teaching as opposed to research type activities. 44% of respondents indicated that they prefer teaching, with a further 26% of respondents claiming they prefer research. The remaining 30% of respondents indicated that they enjoy both teaching and research and therefore have no preference towards either of the two.

These figures were cross-tabulated with the responses by the participants towards their self-assessment of how productive they are in the teaching activities of working with students, teaching preparation / subject development, and the research activities of reading / researching and writing.

Of the 44% of participants who indicated teaching as a preference, 67% of those indicated being productive when working with students, while a further 22% indicated that they were very productive when working with students. 44% of respondents indicated being productive with teaching preparation / subject development with a further 33% also claiming being very productive in this activity. Clearly those who enjoy teaching feel that they are being productive.

Of the 26% respondents who indicated research as a preference, 66% claimed they were productive in reading / researching, while interestingly 34% indicated being unproductive. Writing activity also produced a paradoxical result for those staff who indicated a preference for research feeling unproductive in this area (25%).
Possible reasons for this are explored in the Discussion section following the analysis of psychological and environmental factors.

**Psychological factors influencing productivity**

Work motivation was questioned using the “Job Satisfaction Survey” created by the Wellness Council of America (WELCOA) (2004). This poses a series of questions around job satisfaction such as personal values fit with organisational values, knowing work expectations, relationships with superiors and colleagues, autonomy and independence and feeling valued and recognised for work done.

Organisational communication, values and leadership styles were explored through a series of questions about values and managerial support. When asked whether their values fit with the organisational values the modal response of 4 (out of the 7 point scale) indicated that most occupants had a neutral feeling towards the statement.

In response to the question “I know what’s expected of me at work”, an average value of 4.96, with a coefficient variance of 30% was indicated by respondents, suggesting these knowledge worker’s agree that they know what is expected of them at work.

Relationships with their managers (Figure 10) appear to be generally sound, with respondents largely agreeing with the statement “my manager cares about me as a person”, with a mean response of 5.12 and a coefficient of variance of 33%.

![Figure 10 My manager cares about me as a person](image)

They also mainly agreed with the statement that their manager is aware of their work and reviews it regularly (mean response of 5.0). They also felt that innovation and creativity were supported - 56% of respondents agreed that creativity and innovation
are supported with a further 4% strongly agreeing and a modal response of 5 on the 7-point scale.

Recognition and being valued are vital areas of motivation, and responses to questions indicated these were generally being satisfied. 48% of respondents agreed with the statement that “I feel valued and affirmed at work” with an additional 12% strongly agreeing (Figure 11); together with the statement “I feel recognised and appreciated at work” achieving a positive skew on the graph (Figure 12). Two members of staff are however clearly disaffected and strongly disagreed with both statements, as they did for Figure 10.

![I feel valued and affirmed at work](image1.png)

Figure 11 I feel valued and affirmed at work

![I feel recognised and appreciated at work](image2.png)

Figure 12 I feel recognised and appreciated at work

Independence and autonomy – essential features of the work environment for knowledge workers – were tested through two questions. “I feel free to do things the way I like at work”, achieved a high average response of 5.28 suggesting that these academics do agree with the statement (16% of respondents strongly agreed),
and “I have the opportunity to learn what I want to at work” achieved a mean response of 5.48 - 60% of respondents agreed and a further 24% strongly agreed. The need for independence and autonomy are again being satisfied for the majority of staff.

One of the real tests of job satisfaction is whether the worker enjoys being at work. That “Monday morning feeling” appeared to be largely absent for the majority of staff. The modal response of 6 (out of 7-point scale) for all four questions relating to positive affect: “I look forward to going to work on a Monday morning (Figure 13); “I feel positive and up most of the time at work”(Figure 14); “Work is a real plus in my life” (Figure 15) and “I am engaged in meaningful work” (Figure 16) all suggest a majority of the workforce that is generally very positive and happy at work. There are one or two staff members clearly not so satisfied with their work.

Figure 13  I look forward to going to work on Monday morning

![Bar Chart for I look forward to going to work on Monday morning](chart1)

Figure 14  I feel positive and up most of the time I am at work

![Bar Chart for I feel positive and up most of the time I am at work](chart2)
Relationships with colleagues were tested through two statements - “Most interactions at work are positive with colleagues” achieved a modal response of 6 with a further 5 staff strongly agreeing with the statement. “I have good friends at work” also achieved a modal response of 6 with a further 7 staff strongly agreeing with the statement. Relationships at work are clearly a positive factor and could contribute to collaborative productivity.

**Workspace and environment effects on productivity**

When asked to comment on the features, conditions or situations that make it harder to perform their task and ultimately lower their productivity, two areas were highlighted by the majority of respondents – noise levels and thermal comfort.
Participants were dissatisfied with the level of noise within their workspace, frequently interrupted and dissatisfied with access to quiet spaces and privacy. The lack of full-height partitions was a large contributory factor to this lack of noise privacy. Sound can travel very easily from one office to another and from the corridor or from meeting areas beside offices.

![Frequency of unwanted interruptions](image1)

Figure 17  Frequency of unwanted interruptions

![Access to quiet spaces and privacy](image2)

Figure 18 Satisfaction with access to quiet spaces and privacy

Given the partitioning system, it is unsurprising that 70% indicated that noise levels make it harder to perform their tasks. Figures 17 and 18 clearly demonstrate inadequate access to quiet spaces and frequent unwanted interruptions, with a wider range of reported satisfaction with noise levels (Figure 19) – possibly due to individual office locations, with some rooms having less external noise than others.
From cross-tabulation of results, 64% of those that found noise levels to be unsatisfactory, also claimed that the built environment had a negative impact on their work.

![Overall noise levels](image)

Figure 19 Satisfaction with overall office noise levels

Staff were generally satisfied with winter thermal conditions, however, summer thermal comfort was less satisfactory with nearly 40% of the staff feeling less comfortable and dissatisfied with summer temperatures in their office. The effect that the thermal conditions have on the participants’ perceived level of productivity is shown in Figure 20. Three staff (14%) indicated a major response claiming their productivity was decreased by half, meaning that they were only productive 50% of the time when affected by poor thermal comfort. With a mean response of around 72% and a coefficient of variance of 24%, the data showed a fairly consistent response.
Other issues that were considered to hinder work effectiveness included a lack of storage (16% of respondents feeling dissatisfied with this). 12% of respondents indicated having no window and a lack of office space as having a negative impact on productivity, while 8% of respondents claimed that a lack of fresh air, changes in technology and a lack of security and privacy also negatively influenced productivity levels. 4% of participants claimed a lack of control over thermal conditions and uncomfortable office furniture make it harder to do their work.

In regard to features, conditions or situations that make it easier to perform their tasks and ultimately increase their productivity, responses such as having their own office, having a window to look out of, natural light within the office and access to fresh air were indicated. Other responses by the participants included good office layout, ability to interact with others, sufficient office spaces, good IT support, good lighting, superior office technology, access to other spaces, the possibility to work from home and good office furniture as being features, conditions or situations that make it easier to do the work.

In regards to the physical and physiological factors the sample was overall generally satisfied with their workspace layouts and office furniture and overall satisfied with the usability and the flexibility of office furniture. On the whole participants claimed feelings of satisfaction with thermal conditions in winter, but were dissatisfied with thermal conditions in summer, identifying that they have no control over heating and cooling and very little control over ventilation. Given that respondents had no
control over lighting conditions, surprisingly they indicated they were neither satisfied nor dissatisfied with the overall quality of lighting within their workspace. Some offices were subject to late afternoon glare, with background lighting being on all the time.

![Diagram: To what extent do you think your work performance (overall productivity) is affected by the built environment](image)

Figure 21 Effect of the built environment on perceived productivity

When asked to comment on the effect of their work environment on productivity, this building produced some worryingly negative responses, 3 staff believing the environment to have a negative impact equivalent to 20% of their productivity, 1 staff member perceiving their productivity reduced by 10% and 5 staff feeling their productivity is reduced by 5%.

**DISCUSSION**

Self-assessments require workers to judge their own productivity, and therefore places some doubt over the integrity of such assessments (Leaman and Bordass, 1999). However Olson (2000) sees self-assessment of productivity and performance as being one of few recognised methods of measuring knowledge work, with self-assessments having the ability to cover things such as the amount of work that gets done, the time it takes to do the work, the quality of work produced and the number of errors within the work. Knowledge workers work autonomously and are generally realistic about what they are capable of doing and their outputs.

In this analysis, academics have been surveyed as representatives of knowledge workers. Academics undertake a wide range of tasks that are synonymous with knowledge work such as information creation and new knowledge generation.
(research and writing, collaborative research), building and continuously updating a personal knowledge base to be expert in their field (reading and researching existing information), reformulation and representation of information (teaching preparation), as well as a number of relatively routine tasks (student assessment, e-mailing) and participation in meetings.

In terms of the psychological factors that influence job satisfaction, the majority of staff were very positive about their work – finding it meaningful and looking forward to it (modal response 6 out of the 7-point scale for the four relevant questions of dispositional affect - Figures 13, 14, 15 and 16). Good relationships with colleagues would also confirm this positive attitude and lend support to the self-assessment of strong collaborative productivity. Feelings of appreciation and being valued for their work also appeared to be on the positive side further strengthening the view that the majority of academic staff have a good measure of job satisfaction.

When asked to identify which they prefer doing - teaching or research activities, 44% of respondents indicated they prefer teaching with 26% indicating they like researching more than teaching. When breaking down these responses further, a fairly large percentage of those that prefer researching felt themselves to be unproductive, which raises questions as to the possible reasons for their assessed low productivity. One possibility may be that those who prefer researching may assess their level of productivity more stringently or that research requires more focused attention and the diverse range of tasks that an academic is expected to perform may limit the amount of time they feel they devote to research – and hence feel their potential productivity is reduced from that which they consider themselves capable. A further explanation may lie in the physical work environment – given that job satisfaction measures are generally high. Noise levels and interruptions appear to be the most likely hindrance to concentrated work. Work reviewed by Jett and George (2003) suggest that the intense and focussed concentration required for tasks such as writing research papers, is easily disrupted by outside noise and conversation. The work environment provided does not afford good noise insulation or a distraction-free environment (Figures 17, 18 and 19) and could contribute to the perceived lower productivities of those research tasks that require concentration. This confirms work by BOSTI Associates (2001) where offices without full height
enclosure and acoustic privacy were found to inhibit work requiring concentration. The thermal comfort regime also could contribute to lowered perceived productivity - thermal comfort is perceived to reduce productivity by 30% for those staff affected. This finding is fairly consistent with the findings from the literature and other sources with Leaman (1995) noting that even the most well designed buildings will have up to 20% of its staff dissatisfied with overall comfort conditions. This combined with other issues with the building (ventilation, lighting, storage) lead to 43% of staff feeling that the work environment impacts negatively on their productivity in some measure.

CONCLUSIONS

A small group of academic knowledge workers were surveyed for their job satisfaction and motivation and the influence of the built environment on their self-assessed productivity for a range of activities typical of knowledge work - information creation and new knowledge generation, (research and writing, collaborative research), knowledge acquisition (reading and researching existing information), reformulation and representation of information (teaching preparation, research writing).

Staff have generally high levels of job satisfaction, feeling that they are engaged in meaningful, enjoyable work, recognised and valued for their contribution, supported by their manager and having good relationships with colleagues. This latter factor being likely to enhance collaboration and communication.

They identified two major aspects of the workspace inhibiting their productivity - noise levels and thermal comfort, especially in summer. Uncomfortable thermal conditions were perceived to have a negative impact on productivity generating an average reduction of 28% in output, with some staff reporting reduced productivity of 50%. The major issues for staff with noise levels were mainly from unwanted interruptions and limited access to quiet spaces and privacy. Given the partial-height partitioning system, it is unsurprising that 70% indicated that noise levels made it harder to perform their tasks. From cross-tabulation of results, 64% of those that found noise levels to be unsatisfactory, also claimed that the built environment had a negative impact on their work. Worryingly, 9 staff (36%) perceived that the overall built environment reduced productivity by between 5-20%. 


Having a window to look out of and access to natural light were perceived to positively affect an academic’s level of productivity, as were up-to-date technology and IT support, together with ergonomically designed furniture.

The results from the series of self-assessments tended to show that on the whole the sample group felt themselves to be reasonably productive in all the tasks undertaken, with the exception of attending meetings. The sample tended to be more productive in doing those activities they enjoyed the most, with 44% of respondents indicating a preference towards teaching, 26% indicating preferring research, while 30% claiming no preference over teaching or research. Those staff indicating a preference for research, also indicated lower levels of self-assessed productivity.

Given the environmental shortcomings identified (poor acoustic privacy, poor access to quiet spaces, frequent interruptions), it is likely that these have a major impact on those tasks such as research writing that require concentration and thus on research productivity. Distraction-free acoustic privacy is a recognised environmental issue affecting those tasks that require concentration (BOSTI Associates 2001) and more attention should be paid to providing options for quiet working.

REFERENCES


http://www.steelcase.com/na/files/7f3627a3329b4337be98adc488a2145b/WorkplacePrivacy.pdf

WELCOA, 2004, Job Satisfaction Survey,

http://www.welcoa.org/freeresources/pdf/job_satisfaction_survey.pdf#search=%22Job%20satisfaction%22

Western Management Consultants (2002), ‘Herding Knowledge Workers’,

http://www.wmc.ca/bs_home.html?PAGEID=82025&sessionstorexwsl=noskin