

Open plan office space? If you're going to do it, do it right: A fourteen-month longitudinal case study.

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There are compelling findings that open-plan office environments are associated with declines in employee wellbeing. In spite of this, the move towards shared office environments continues; yet there is a lack of research describing open-plan offices that have positive outcomes for workers. We describe a “best practice” open-plan fit-out of a law firm and provide data from occupants relating to their performance, well-being, and collegial relationships. Six months after moving to an open-plan office, staff were anonymously surveyed, and 24 were interviewed. Fourteen months later, occupants responded to a follow-up survey. Positive outcomes relating to aesthetics, collegiality, and communication were achieved through good technical design and thoughtful ergonomic assessment of the needs of employees and the requirements of their tasks. A gender difference emerged whereby female, but not male, workers in this environment reported feeling observed. This has implications for the relatively different impact these environments may have on workers. Thus, by following ergonomic principles to create open-plan offices that are ‘safe by design’ organizations can ameliorate many of the negative consequences associated with these environments.

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1 Introduction

This study was motivated by recent findings indicating that not only are open-plan offices generally disliked by employees, but they also have negative health and well-being outcomes (Bergström *et al.*, 2015; de Croon *et al.*, 2005; Richardson *et al.*, 2017). There are findings that, in open-plan offices, collaboration and face to face interactions deteriorate (Bernstein and Turban, 2018; Morrison and Macky, 2017) and visual and auditory distractions increase (Haapakangas *et al.*, 2018; Roper and Juneja, 2008; Yadav *et al.*, 2017). A recent systematic review asking, “Does workplace design (specifically individual offices compared with shared workspaces) affect the health of workers?”, found that, “...compared with individual offices, the introduction of shared or open-plan office space is remarkably consistent in its consequences, with *every study* reporting deleterious effects on employees’ health.” [emphasis added] (Richardson *et al.*, 2017). The key aim of the current study was to investigate the experiences of employees of a legal firm who had recently moved into open an open-plan office; one identified as “best practice”. Being guided by the extant literature and previously measured outcomes described above, we focused on the impact the new office space had on performance, well-being, and collegial relationships.

There is a great deal of research with a focus on the physical spaces in which people work (for recent reviews of research on indoor environment quality (IEQ) see: Yousef *et al.*, 2016a; Yousef *et al.*, 2016b), with particular attention paid to open-plan offices; now widely adopted in North America and Western Europe, and increasingly common elsewhere (Ding, 2008; McElroy and Morrow, 2010). The advantages of open-plan working have been touted as flexibility and cost efficiencies, along with claims of enhanced communication and opportunities for collaboration and innovation (Bernstein and Turban, 2018; Maher and von Hippel, 2005). However, empirical research indicates that employee reactions are more equivocal. Many studies reveal how widely disliked open-plan offices are due to a lack of privacy and increased disturbance from others (Ding, 2008; Haynes *et al.*, 2011; Kim and de Dear, 2013; Kupritz, 2003; Sundstrom *et al.*, 1980), a sense of depersonalization and low status (Hongisto *et al.*, 2016), feeling exposed and scrutinized (Hirst and Schwabenland, 2018) and, perhaps most importantly, negative health and wellbeing outcomes (Morrison and Macky, 2017; Richardson *et al.*, 2017).

In partial contrast to the above, Halford (2004) found that responses to an open-plan environment in one organization varied widely, with some reporting very low satisfaction with the space, but others responding quite positively, even in objectively unappealing office spaces. In addition, there is some evidence that, when carefully designed and thoughtfully utilized, open-plan spaces can lead to more inclusive organizational cultures and improved employee satisfaction and communication (McElroy and Morrow, 2010; Rosenberg and Campbell, 2014).

In addition to these social and affective outcomes, the cognitive and performance deterioration related to both auditory (Banbury and Berry, 2005; Landstrom *et al.*, 1995; Schlittmeier *et al.*, 2008; Sundstrom *et al.*, 1994) and visual (Liebl *et al.*, 2012) distraction have been noted as key disadvantages of shared workspaces. Roper and Juneja (2008) state that auditory distraction in open-plan settings is stressful and impairs performance, particularly if conversations are both intelligible and perceived to be irrelevant to the listener's activities. These authors found that disruptions interfered with reasoning, lead to mistakes, wasted time, and increased fatigue. According to Liebl *et al.* (2012), research investigating the combined effects of different types of distraction is lacking (i.e., visual vs. auditory, along with the frequency, duration, and relevance of an interruption). These authors investigated four elements of cognitive processing (verbal short-term memory, reasoning, attention and text comprehension), finding that background speech, particularly when easily understood,

interfered with short-term memory and reasoning, and created annoyance; but that there was no significant effect on attention or text comprehension. The visual element of their experiment was confined to lighting, with dynamic lighting (a moving beam) eliciting complaints and dissatisfaction (as a proxy for well-being) but not significantly impacting performance. There are equivocal findings regarding the impact of overheard conversations, with some researchers (e.g., Jones and Macken, 1995) finding that multiple, unintelligible, voices are less distracting than just one or two (although, if voices came from several different directions, the disruption increased again). However, others have found single voices in open-plan offices to be less disruptive than multiple voices (Yadav *et al.*, 2017). Banbury and Berry (2005) also found “irrelevant sounds” to have the biggest impact on concentration and identified, not conversations, but an unanswered phone, as being the most disruptive, speculating that this source of noise was both particularly long lasting, and also elicited annoyance caused by the fact that their colleagues were not at their desks when they should have been.

The availability of, and access to, private meeting rooms and other quiet spaces is one way to mitigate the negative consequences of distraction. In this vein, Haapakangas *et al.* (2018) found significant differences between two organizations moving to open-plan environments. In the organization with fewer designated quiet spaces, workers experienced greater dissatisfaction along with increased interruptions. In contrast to this however, Banbury and Berry (2005) found the provision of enforced areas for quiet to be the *least* popular intervention, instead recommending ensuring phones were diverted efficiently, equipment quietened, and seating arranged so that, where possible, those who need quiet are located away from noisy equipment or colleagues.

Further work investigating the aesthetics of shared space points to the importance of the ‘greening’ of open-plan office environments with the addition of indoor potted plants and ‘green’ or ‘living’ walls. Research has linked greening to a range of positive outcomes including productivity (Bringslimark *et al.*, 2007), reduced sick leave and improved health outcomes (Mitchell and Popham, 2008), attention (Khan *et al.*, 2005; Raanaas *et al.*, 2011), job satisfaction (Dravigne *et al.*, 2008), positive mood (Adachi *et al.*, 2000), and reduced stress (Lohr *et al.*, 1996). Other researchers, however, have found more equivocal results with positive outcomes occurring only in some circumstances (Bringslimark *et al.*, 2009).

There is also the potential for gendered consequences of open-plan offices relating to the increased exposure, visibility, and expectations to interact experienced by workers in these environments. While we do not have adequate space to fully review gender as it relates to the

physical work space within the work and organizational literature, we maintain that it is essential to understand gender in ways that neither problematize femininity nor privilege masculinity (Runté and Mills, 2006); being mindful to avoid positioning women as the gendered “others,” with men the “norm”. Given that the “worker” in organizational theory is often assumed to be male (Boyle, 2002), it is important to acknowledge that many aspects of organizational life will be experienced differently depending on one’s status, socialization, appearance, role, and also gender. Research with a focus on the “masculinist culture of organizations” (e.g., Boyle, 2002; Hatchell and Aveling, 2008) informs our thinking in this area and, though often in the context of discrimination and women’s under-representation, it may be applied equally to the way work is enacted, how workplaces are arranged, and to the way women and men might experience a workplace differently.

Recent research by Hirst and Schwabenland (2018), examining how women respond in open-plan offices, reveals that some women feel uncomfortable with the constant “male gaze”; several of their female respondents observed, “...there isn’t anywhere that you don’t feel watched.” (p. 170). Other women felt the need to change their appearance and the way they dressed in order to signal status, one woman stating, “...I spent a lot of money on clothes. And also where I used to wear a cardi at work, it’s a jacket now.” (p.170). There was an acceptance that, in order to make the most of the open-plan environment and concomitant access to high status colleagues, these women had to alter their appearance and present themselves as both more business-like (jackets and suits) and more feminine (make-up and heels). Interestingly other women (for example a helpdesk officer) refrained from this type of high status dressing in order to signal lower status and not to appear “full of yourself” (p. 171), though still consciously selecting clothing with an awareness that others would notice. Hirst herself describes observing, “...men watching women walk through the long, uninterrupted spaces of the building, sometimes appearing to struggle between their wish not to appear rude and their wish to watch the woman” (p.171).

Though there is little research specifically investigating the impact that being “visible” has on workers in open-plan environments, it was acknowledged as a form of distraction by Liebl *et al.* (2012) who state “...being distracted by seeing someone walking by or being distracted by the feeling of being watched are very real issues in open offices.” (p. 425). Disappointingly, the authors do not explore either of these issues in their research. The notion that women may experience open-plan spaces differently from their male colleagues is a key contribution of the current study.

In sum, despite overwhelming research evidence that, in general, shared workspaces have negative health and wellbeing outcomes, and that cost savings are perhaps the only guaranteed positive outcome, we maintain that the inexorable move towards shared office environments and hot-desking is unlikely to be reversed. As such, the important research questions must now focus on how best to implement open-plan office designs to capitalize on any communication, collaboration, and workplace culture improvements while ameliorating negative consequences of these environments for both male and female workers.

In addressing these questions we are answering the calls for research by Ashkanasy *et al.* (2014) on how work environments impact on employee behaviour, and by Morrison and Macky (2017) on ways to design offices to retain the flexibility and cost saving of flexible work arrangements while avoiding the negative social, psychological, and physical outcomes.

2 Method

The study is a quasi-experiment, utilising the retrospective pretest (or thentest) (Campbell and Stanley, 1963; Nimon, 2014, 2015). As in the current study, the retrospective pretest is typically administered after an intervention (in this case the move to new, open-plan offices) and asks the respondents to assess their pre-intervention attitudes and experience (in this case their liking of the previous office space). Despite risks associated with impression management and memory distortion, Nimon (2015) recommends that researchers utilize the retrospective pretest strategy, in part as it allows workers to evaluate their pre- and post-intervention attitudes using the same frame of reference. Although the design would have been further improved by administering the retrospective pretest separately, time and access constraints precluded this.

2.1 Setting

An opportunity arose to conduct research in a law firm, at that time employing just under 200 people in Auckland, New Zealand, which six months previously, had moved into a newly-built building with an open-plan design. The office space where the firm was previously housed was characterized predominantly by single-cell offices for legal staff, while many professional (managerial and administrative) employees were in central, open spaces. The offices were not soundproof, which meant most staff could be heard, even if they couldn't be seen. The chief operating officer (COO) facilitated access to employees by allowing our invitation to participate to be posted on the firm's intranet. Staff were invited to volunteer by directly

contacting the researchers for confidential interviews or by linking through to an anonymous survey.

The office itself was purpose-designed and built for the law firm, occupying the entire top level of a five-story building, just outside the CBD of Auckland, NZ. The new office has very high indoor environment quality (IEQ), with floor to ceiling windows and a large glass-ceilinged atrium in the centre, offering abundant natural light. Other features include:

- Over 1,300 plants, including ‘green walls’ that offer privacy and reduce sound
- Acoustic quietening throughout, achieved through large padded light shades, insulation, carpet and soft furnishings
- Twenty-eight soundproof “collab” (collaboration) rooms, all with “plug and play” ICT capabilities
- A closed-off, internal library with strict silence norms to facilitate concentrated work
- A lunchroom with a garden café feel and tables which are frequently used by groups of employees (including senior partners) who would have no reason to interact in the usual course of their day
- Large, modern conference rooms available to book for larger meetings or clients
- Lockers for staff to store outerwear and other personal items
- “End of trip” facilities; shower, etc. for the use of all staff
- State of the art technology with continuous Wi-Fi, “plug-and-play” capabilities on all devices, and seamless access to electronic networks to enable workers to port their laptops, take calls wirelessly, and easily move between different work stations and the collab rooms
- Standing “bar leaners” for formal and informal meetings alongside each workgroup
- Sit-to-stand desks
- Hydration stations throughout the office, offering both sparkling and still water on tap

Thus all employees have their own desks but, in addition, all legal and most corporate (allied) staff have numerous choices of where to sit and how to work within their day, as well as open walkways and a light-filled atrium with comfortable seating for people to meet and collaborate (see appendix 1 for images of the office space). Many of the initiatives and aspects of the workstations were the result of intense collaboration with a working group comprising architects, designers, and employees from all levels of the organization, along with ongoing communication with all staff. Employees of the firm were asked what they wanted and needed from their new workspaces and every attempt was made to accommodate requests (other than for one’s own office) and to have workstations suited to the work itself. For example, those who wanted to, could have a say in selecting features down to the wallpaper for the collab

rooms and staff voted on their preferred chairs and desks (which had been set up in the old offices prior to the fit-out).

2.2 Time 1

An invitation to participate in the study was advertised on the firm’s intranet. Employees were invited to contact the researchers directly if they were willing to be interviewed. Interviews were conducted in a three-week period in late 2016 (six months after the move to the new offices) in a collaboration room that was made available to the researchers. Of the 24 interviewees, 15 were female, 9 were lawyers (2 partners, the balance senior and junior lawyers) and 15 were in corporate services (e.g. IT, HRM, administrative and legal support). The mean age was 34.2 years (range from early 20s to late 60s); length of service ranged from 3 months to 12 years (mean 3.2 years) (see Table 1). The interviews lasted between 15 and 43 minutes (mean 27 minutes). Questions were focussed on their previous office building, and what they liked and disliked about the new premises in terms of privacy, productivity, distraction, and how the office design affected their relationships with other employees. In addition, five questions were asked on a rating scale of 1 (very dissatisfied) to 10 (very satisfied), regarding how satisfied they were with their privacy, distraction, how the change was managed, and the extent to which they liked both their previous offices and new ones. All interviews were conducted either by one or both of the authors. They were transcribed and made available to the participants.

In addition, an anonymous online survey was made available to the all of the staff on the Qualtrics platform (those who were interviewed did not also complete the online survey). The survey included the same five rating scale items presented in the interviews, along with demographics, an opportunity for employees to describe what they liked most and least about the offices, and what they would alter (in open-ended fields). For the rating scale items, as the respondents moved the “dot” along the scale on their phone or computer, the corresponding number (in 1/10 intervals of the scale) was indicated and recoded by the data collection site (see appendices 2 and 3).

In total, data were collected from 101 employees (representing 57% of the 177 staff). See Table 1 for demographics of respondents at both time 1 and 2.

Table 1: Respondent Characteristics

Time 1	Interviewed n = 24	N = 101 (total, including interviewees)	%
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Male	9	30	29.70
Female	15	71	70.30
Partners	2	11	10.89
Lawyers	7	51	50.50
Corporate services	15	39	38.61
18-25	6	24	23.76
26-35	12	45	44.55
36-45	2	2	0.19
46-55	2	4	0.39
Over 55	2	5	4.95
Declined to answer		1	0.99
Time 2		N=70	%
Male		18	25.71
Female		52	74.29
Partners		5	7.14
Lawyers		39	55.71
Corporate services		26	26
18-25		15	21.43
26-35		34	48.57
36-45		15	21.43
46-55		3	4.29
Over 55		2	2.86
Declined to answer		1	1.43

The COO gave the researchers a tour of the premises, and the days we were onsite allowed direct observation of the workspaces, the conference rooms, the lunchroom, the library, and the collab rooms; allowing general impressions to be made as well and giving context to the comments made by respondents.

2.3 Time 2

In March 2018, 14 months after the initial survey and interviews (20 months post-move), a follow-up survey was distributed to all employees at the law firm. The questions were similar to those at time 1 but excluded the question on change management, and included like – dislike scales relating to privacy, distraction, and the space itself; and giving respondents the opportunity to outline, in their own words, what they did and didn't like and what, if anything, they would alter (see appendices 2 and 3). In this second phase, data were collected from 70 employees (representing 32% of the now 220 staff, see Table 1).

2.4 Analysis

2.4.1 Rating data

The rating data were graphed, showing the time 1 and time 2 responses with standard deviations. Responses were compared using either a paired (for within-group comparisons) or a two-sample t-test. A two-sample t-test was used in the time 1 to time 2 comparison because all employees were given an opportunity to report on their experience of the office at both phases. Given there was turnover in the organization, and also that responses anonymous at both data collection points it was not possible to match the sample.

2.4.2 Qualitative data

To interpret the qualitative data we used template analysis (Crabtree and Miller, 1992; King, 1998) a type of thematic analysis (Braun and Clarke, 2006; Clarke and Braun, 2017) which has been used in other recent ergonomics studies (e.g., Vassie and Richardson, 2017; Vincent *et al.*, 2014). A template is described by Crabtree and Miller (1992, p.21) as an “organizing codebook” and they note that template analysis occupies a middle ground between content analysis, where codes are predetermined, and grounded theory, where they are not. Codes are labels attached to themes (King, 1998). While thematic analysis requires the identification of codes which are then classified into themes and sub-themes emerging from the data, template analysis is more structured, allowing for the creation of *a priori* themes which have theoretical justification, or which originate from extant empirical research (Brooks *et al.*, 2015; King, 1998). The template is subject to subsequent amendment if and when themes emerge from the data.

Both authors in the current study participated in the coding process, noting that the main themes emerging from prior research into open-plan offices were: i) the physical office space ii), the impact that open-plan offices have on collegial relationships/collaboration, iii) how open-plan office design might contribute to distraction from work/productivity and iv) perceptions of privacy/visibility (e.g., Haynes *et al.*, 2011; Kim and de Dear, 2013; McElroy and Morrow, 2010; Morrison and Macky, 2017). Therefore, these four themes were included in the interview questions at time 1 as well in the open-ended survey questions at times 1 and 2, along with more general opportunities for respondents to comment on other aspects of the new offices.

As part of the process of analyzing the data, both authors read the interview transcripts several times, reviewed the survey comments and independently listed key concepts. Following a discussion of our categories, we formulated a final set emerging sub-themes, relating to the

four *a priori* main themes. As part of the process, we wanted to identify patterns of responses, where at least three participants were making comments relating to a sub-theme. For example, reflections of the physical space were separated into functional vs. aesthetic factors, with functional referring to features like desk-size and storage space, and the aesthetic relating to décor, artwork, plants and a sense of light and space. In an iterative process, we cycled back to the literature to see where there were similarities and differences. As an example, the law firm’s focus on egalitarianism, in this case, the same-sized desks, appears to be a novel finding which emerged from the data.

3 Results

The thematic summary of the qualitative data is presented in Table 2. Tables 3-6 contain examples of responses that illustrate positive and/or negative comments within each theme and emerging sub-theme. Each theme is discussed below, along with the rating data from respondents.

Table 2. Themes and emerging sub-themes

A priori theme	Sub-theme	Features
i) Physical space	Functionality	Personal space Desk features Storage space Rubbish bins Collaboration rooms, lunchroom, atrium Hydration stations
	Aesthetics	Natural light and windows Décor and artwork Plants
ii) Interpersonal relationships	Collaboration	Overhearing and sharing information Access to managers and colleagues
	Collegiality	Informal relationships Friendship
iii) Productivity	ICT	Docking stations Seamless wifi
	Being observed (accountable)	Presenteeism Pressure to be seen to be working
	Distraction	Auditory Visual
	Coping strategies	Headphones

		Use of collab rooms
iv) Privacy	Personal conversations	Overhearing others Taking personal calls
	Being observed (visible)	Feeling exposed

3.1 The physical space

At time 1, having described the previous offices as “tired”, “grungy”, and “outdated”, most of the staff liked the visual impression of the firm’s new residence. They appreciated the natural light, the colour scheme, the 1300 plants, the lunchroom, and the atrium which went from the ground floor to the transparent ceiling above the top (fifth) floor where the firm was located. The terms they used included “fresher”, “friendly”, “sociable”, “inviting”, and “open”. The office space was a source of pride to many employees, some of whom had brought family and friends to see their new offices. There were a few negative comments focusing on the modern décor and “pop” art, the smaller size of the desks, the reduced storage space (as part of the move to the paperless office and an economical use of floor space), and the lack of room to personalize their workstations. While the absence of privacy and greater visual and acoustic distraction was problematic to some, most believed the use of the many meeting rooms, laptops with wifi and headphones had ameliorated these issues. Some of the senior lawyers and managers missed their individual offices, and the views they had enjoyed. As one partner wryly commented, “I had a lovely corner office, I’d close my door, and had complete privacy. And a big space, your typical partner’s harbour view corner office. I’d made it!” Nevertheless, he too found the new space to be generally superior. It is worth noting that many respondents particularly appreciated the egalitarian desk allocation, saying for example, “I like the equality, the fact that everybody’s got the same work station, the same basic facilities, including the partners.”

At time 1, on a scale of 1-10, the response to the question, “How much do you like the new offices in general?” was very positive ($M = 8.38$, $SD = 1.39$), with the old offices rated significantly less positively ($M = 3.21$, $SD = 2.03$), $t(155) = 1.97$, $p < 0.001$. The researchers suspected that a contrast effect might be responsible, at least in part, for this high rating, but, even after 20 months (or not having been in the previous offices), there was no significant difference in the overall positive evaluation of the new offices ($M = 8.60$, $SD = 1.41$), $t(140) = 1.98$, $p = 0.23$ (n.s.). A question asked at time 2, which was not asked at time 1 was how much employees liked their own work space (as opposed to the firm’s offices in general). This

resulted in an mean score of 7.57 ($SD = 1.84$). Although lower than the score for the whole environment $t(69) = 1.99, p < 0.001$, this nonetheless indicates a positive evaluation of the work space. See figure 1 for the mean ratings ($\pm 1SD$) given by respondents on the 1 – 10 rating scales.

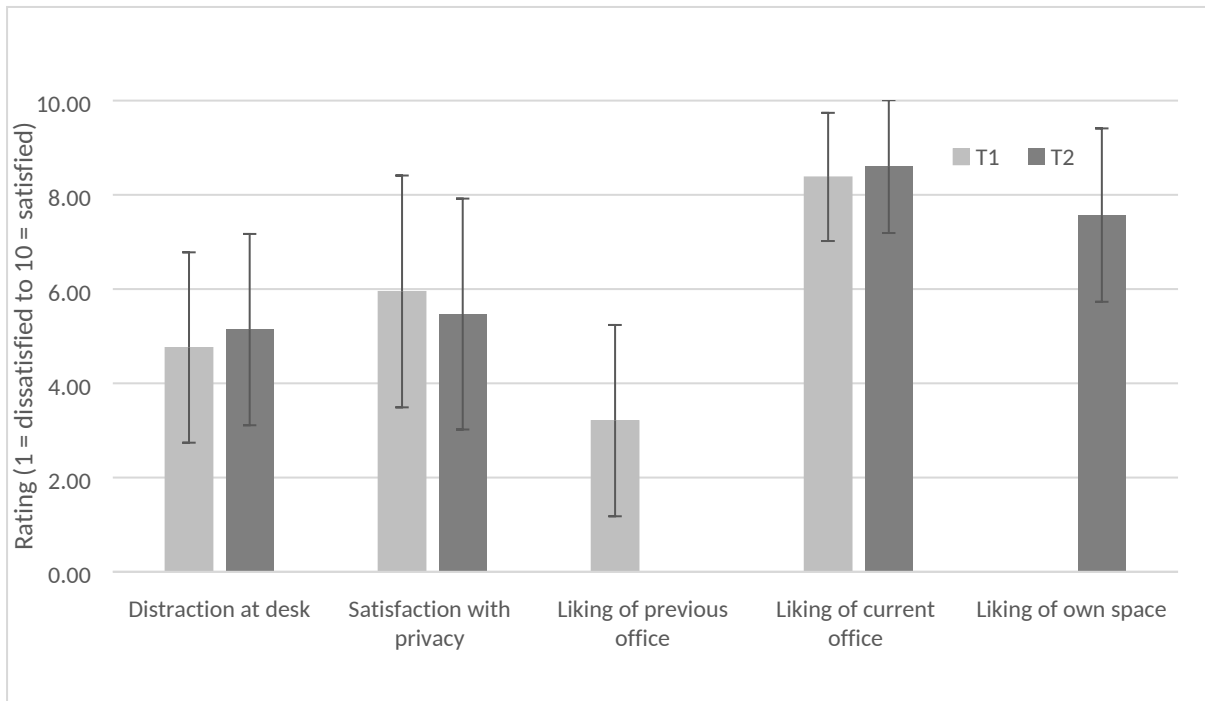


Figure 1: Mean response to rating data ($\pm 1SD$)

As well as using the 1-10 rating scale, respondents were given the opportunity to identify aspects of the physical space they especially appreciated. For example, at time 2, aspects of the offices that staff liked were the fact that there were a variety of spaces such as the collab rooms and the library (mentioned 23 times), the plants (20), general aesthetics such as natural light and the décor (16), the kitchen and reception area (16), and the opportunity for increased interactions with others (8). Less often identified were the workstation features such as dual screens and sit to stand desks (4), and hydration stations/sparkling water (4). Many respondents were quite effusive in their description of the spaces and features of the open-plan offices, see Table 3. In response to the question about what they did *not* like about the offices at time 1, most respondents (around 80%), either said “nothing”, entered NA, or suggested just one small aspect of the new offices that they found challenging. At time 1, the most common negative responses were around a lack of storage space.

At time 2, on the other hand, 60% of respondents answered this question, and the most common aspects identified as something they would like changed were space and crowding. It

is worth noting that 43 extra employees were housed in the same space by the time the second data collection took place. The topic of crowding, not mentioned at time one, had become an issue for several employees in the intervening months. Wanting more either more collab/meeting rooms, more space, or more storage was mentioned by 62% of people answering this question at time 2.

Interestingly, in this office, the numerous plants were both liked and disliked. At both time 1 and time 2, plants were frequently mentioned in the context of what people *most* liked about the office but, on the other hand, also caused irritation and were mentioned as something workers would like to see changed. The two emerging sub-themes here relate to the physical advantages or constraints of the space (termed *functionality*) and the look and feel of it (termed *aesthetics*). See Table 3.

Table 3. Quotes: Physical space

Positive comments	Negative comments
Functionality	
Time 1	
Ability to use other spaces like team tables, quiet rooms, as needed, and not feeling stuck within an office. The little rooms are brilliant. Love the kitchen and the bridges.	The lack of space, lack of rubbish bins at desks, small lockers
Movable desks, collab rooms, modern kitchen, hydrations stations.	The storage at your desk and the way the desk slide cupboards work (i.e. hard to see / get stuff in the middle)
The stand-sit desks are fantastic, as are the two monitors for everyone.	
The bar leaner is great... if you want to get away from your desk but you don't want to be secluded in a collab room, they're quite nice to go to.	
Time 2	
I love the use of space - the collab rooms are such a good idea and I don't know what we'd do without them. Having the forethought to have collab rooms in an open-plan space is genius. And the fact they are constantly being used is testament to that.	Not enough collab rooms
Social and interactive being in open-plan, having plants around helps when in office long hours.	I don't like that some team areas are more squished in than others. I don't know how you would solve that but yeah it just seems slightly unfair at times.
	I dislike that desks are being packed into every spare space, including hallways, because there isn't enough room in the office.
Aesthetics	
Time 1	
The offices are beautiful and a lovely place to work. The plants are great!	[I dislike] the plants. They are ugly and just look like weeds. The dust on them makes people with allergies sneeze, and the bark is attracting insects.
...they've also got plants in plant boxes that go higher than my eye level, so you still have a feeling of privacy. But because they're plants, I suppose rather than totally impermeable walls, you still have a feeling of space and air and light.	The plants as dividers don't really do much other than attract small flying insects
Greenery and natural light is great.	Some of the design features were a little bit tacky or a little bit trite or clichéd.

Time 2

I love the greenery, it feeds my soul! I also love the extra lightness and feeling of fresher air.

Having plants around helps when in office long hours.

I also love the plants which make a bit of a barrier so others can't see my screen when walking past, and it creates a closed in feel while still being open.

[I dislike] the dying plants.

[I would change] to better control of flies/bugs in the greenery (the only downside of the plants is the bugs)

The crazy wallpaper in the collab rooms. Very distracting.

3.2 Interpersonal interactions and relationships

One of the questions asked was how the new office space affected the participants' relationships and interactions with colleagues. While the distraction of others' voices annoyed some, many found it useful to overhear conversations that informed them about a client, a case, an aspect of the law, or other work-related matters. Junior lawyers, in particular, found that the open-plan desk arrangements exposed them to the useful conversations of more senior lawyers. It also provided opportunities to contribute their own knowledge to a conversation and signalled to some that their views were important. Administrators and junior staff noted that, in the previous building, they felt constrained or intimidated by the closed doors of senior lawyers and managers. In open-plan, it was much easier to see if people were free or approach them in person rather than email them. What irritated people was listening to personal conversations about trivia. This was not only distracting but was considered by some as a breach of office etiquette.

Workers in this office, while critical of some aspects of the layout, almost unanimously felt that co-worker relationships were, by and large, improved by the open-plan desk arrangements, the shared spaces, and the kitchen/café area. There were a few equivocal comments; generally citing distraction as something of a necessary evil that had to be tolerated in order to make the most of the benefits of increased interpersonal interactions. The two clear sub-themes here were the impact the office had on functional work-related interactions (termed *collaboration*) and on general friendliness and relationships (termed *collegiality*). See Table 4.

Table 4. Quotes: Interpersonal relationships

Positive comments	Negative comments
Collaboration	
Time 1	
I love that I can hear what's going on... people have been having conversations and I've actually known what they're talking about and solve it for them. I've been able to stand up and go, Oh, that's taken care of.	I find the whispering a little bit more disruptive. Because you think it's easier to drown out someone that's just having a chat, but you become a bit suspicious about someone whispering.

I like it 'cos you can just turn around and ask people questions if you need them, rather than having to feel like you need to email them if they're in an office and their door is closed.

Yes - being a junior it has made the seniors much more accessible.

It positively impacts my productivity because it's much easier to ask questions and get my work done without needing to wait for answers.

Time 2

It's much easier to approach and interact with others and ask quick questions of those working around me. It's also made it easier for others to approach me.

I think one huge benefit is that we are able to quickly talk to someone if we have any questions and just get on with our work faster. So I think productivity has improved with the open-plan style.

We also have a better understanding of what is happening on other team members' files

I feel the people in 'pods' have developed a greater degree of comradeship, which is good for them. As I'm not in a pod, it's easy to often feel excluded (i.e. casual conversations)

I don't think it has increased the non-work related chat, just perhaps meant it is easier to be distracted by others' non-work related chat.

Occasionally it is hard to concentrate on complicated matters if there are group discussions going on nearby but this is only occasionally.

Collegiality

Time 1

I've been able to get to know my team a lot better, because they sit within talking distance, so get to know everyone around you.

There's a lot more cross-over and a lot more to do with people, and people are quite happy to share their ideas and suggestions.

Stress and negative energy infiltrates a lot more around the team.

There do seem to be several cliques which form that do not assist with collegiality.

Time 2

For the better - it's so nice to form friendships with the people around me - makes the working day so enjoyable!

Improved relationships, see more people outside of my team that I otherwise would

It makes me closer with my team-mates; gives a collegial atmosphere.

I love the open-plan. Because I still get all my work done it quite enjoy being able to stop for 5 or 10 minutes to have a quick friendly chat with someone near me and then get back into it. It creates a nice environment to work in.

Counter-intuitively, the open-plan set up has reduced conversations within my team...We all work quietly at our desks to avoid distracting others. This reduces the general chat among the team...I think it decreases team cohesion overall.

I don't like that sometimes it feels like people are judging you for not giving enough face time as everything is so visible.

There are more distractions but it has also meant there are more opportunities to interact with colleagues in an informal way throughout the day.

Harder to focus [but] more collegial

3.3 Productivity

In response to the rating scale question about workers' distraction at their desks, the mean response at time 1 ($M = 4.76$, $SD = 2.02$) was not significantly different from time 2 ($M = 5.14$, $SD = 2.03$), $t(153) = 1.97$, $p = 0.25$ (n.s.). Considering how close workers are to one another, and the fact that there are no solid walls or screens, a rating of 5 on a scale of 1 - 10 is a positive

result, suggesting that, while employees did not consider themselves entirely free of distraction, neither did they feel especially distracted; perceptions of distraction remained stable over time.

For those who felt that the open-plan office design generally made them more productive, there were three clear themes; first, those whose productivity was improved by the increased ease with which they could access information and collaborate (presented in Table 4, above), second, those who felt that their productivity had been enhanced by equipment such as desks and the improved information and communication technology (the first sub-theme in Table 5, termed *equipment and ICT*), and third, those who were more productive because they felt monitored or accountable (the second sub-theme, termed *accountable*). Workplace norms of “presenteeism” (being present more than required or when unwell (Johns, 2010)) will be intensified in workplaces where employees are monitored or visible, and this effect is in evidence for several of the employees in this study.

In terms of reducing productivity, distraction was mentioned in various contexts (the third sub-theme, termed *distraction*). However, many responses focused, not so much on the impact on productivity, but rather on strategies to ensure that they remained productive in spite of potential distraction from nearby others (the fourth sub-theme, termed *coping strategies*).

Table 5. Quotes: Productivity

Positive comments	Negative comments
Equipment and ICT	
Time 1	
<p>[having two monitors] made a huge difference, and also the wider screens, so that made a big difference. And we also all got laptops</p> <p>... the laptops in the way it interacts with the docking station – I love the [laptop] docking station concept, that’s great, and the fact you can take your portable laptop with you is a fantastic idea</p>	
Accountable	
Time 1	
<p>... knowing that other people can see what I am doing also motivates me to be productive</p> <p>I found I am more responsible because I am more accountable for my actions.</p> <p>Overall [the effect on productivity is] positive - can always be seen, so always working unless nobody is around.</p>	<p>Your coming and going is visible; if you arrive slightly later or leave slightly earlier, you feel the eyes on you. Likewise, you pick up on what time everyone else comes and goes.</p>
Time 2	
<p>I don't really need privacy but having everyone around me keeps me working more consistently.</p>	<p>... it can sometimes feel like you are being watched or even micro-managed more intensely due to the absence of</p>

We're more visible to each other, so more accountable for our whereabouts and what we are doing with our time.

physical barriers found in a more traditional office environment.

I don't like that sometimes it feels like people are judging you for not giving enough face time as everything is so visible. Back at [previous office] there was more of a motto of getting the work done in the time needed and then go home. Now with open space it feels more like a fish bowl and I have noticed more subtle pressure to stay later even if you don't technically need to - based on looks some seniors, even from entirely different teams, give you.

Distraction

Time 1

It possibly makes me less productive but more social

My work can be less efficient at times due to all distractions - but I do like that we see people from different teams more often than in the previous office.

I see more people from other teams which is nice, but I feel guilty having to walk past so many people whenever I need to go to the toilet or kitchen because I am sure it is a distraction having people constantly walk past your desk.

I think the team is closer as we are in such close quarters. More banter (which perhaps sometimes means lower productivity) but the quiet rooms help to get work done.

[I dislike] having my team around me to chat to and getting distracted and unfocussed.

I dislike open-plan. It is not possible to work at your desk without being distracted by others talking around you. We have private rooms to use, but it is impractical to have to work in them all day every day to be more efficient.

Time 2

The only negative impact is distractions from people coming in and out of our little pod.

Can be hard to concentrate with the interruptions, but on the other hand it's good to keep open communication.

Coping strategies

Time 1

I wear headphones at my desk to ensure I don't get distracted

Anytime I'm on the phone I'll go into a collab room.

I'm pretty good with being able to shut everything out... using headphones

Privacy is a little bit of an issue at times, but when that's the case I just get up and take myself into a room and do whatever I've got to do there.

I'm a bit user of the collaboration rooms 'cos I do like my personal space and my privacy, and cutting out the noise sometimes

Time 2

I find it slightly harder to concentrate whilst at my desk - but not if I use the collab rooms

It can be distracting but I've worked in open-plan offices in the UK, Aussie and NZ and this is probably the least distracting of the lot thanks to the dividers, file cupboards between each area, plants and availability of collab rooms.

It definitely reduces [productivity] but not as much as when I started - it has taken me a while to figure out how to use the different types of work spaces and to tune out the distractions

I do tend to get quite distracted with things going on around me. There are the collab rooms or headphones I can use if I have lots of work to do.

3.4 Privacy

Privacy was an issue for some, but by no means all, staff members. In general, it seems most employees were not dissatisfied with the lack of privacy, and there was no significant difference between satisfaction with privacy between time 1 ($M = 5.95, SD = 2.46$) and time 2 ($M = 5.47, SD 2.45$) $t(153) = 1.97, p = 0.23$ (n.s.); scoring close to 6 on a scale of 1 (very dissatisfied) to 10 (extremely satisfied). Considering that the open-plan environment provides almost no privacy at all, the consistent satisfaction with this aspect of the open-plan environment was unanticipated. The two sub-themes emerging from the qualitative data were around hearing others or being overheard (termed *personal conversations*) and feeling exposed or observed (termed *visible*). See Table 6.

It is worth noting that, of the respondents who specifically mentioned being observed, either in a largely positive way (by improving their productivity) or as something they disliked (as below), *all* were women. Whether female staff are indeed watched more than male staff is beyond the scope of the current project, but what is striking is that female staff were certainly more likely to perceive themselves to be observed. Indeed, a word search for: “watched”, “visible”, “privacy”, “exposed”, and “accountable” (all words used by women in this office) from within male responses, turned up “privacy” (and none of the other words) just once as “[I dislike] the lack of privacy” (time 1).

Table 6. Quotes: Privacy

Positive comments	Negative comments
Personal conversations	
Time 1	
<p>But then they’ve also got plants in plant boxes that go higher than my eye level, so you still have a feeling of privacy. But because they’re plants, I suppose rather than hard walls or totally impermeable walls, you still have a feeling of space and air and light.</p> <p>Yeah. Well, I mean, if it’s work you talk on the phone, but if you were to ring and go – What’s for dinner or something, I’d go into the collab room for all of that stuff.</p>	<p>Easy to get distracted, if you see someone is stressed you take on that emotion. There is something protective about having walls around you that is lost in open-plan.</p> <p>[I dislike] feeling like you have to move to a collab room each time your phone rings so you do not distract everyone else.</p> <p>If you’re standing there talking about [trivia] that’s great, but you can go and do that somewhere else where you’re not distracting me work. If you’re wondering [work issue], to me that’s ok. It’s still going to distract me, but it seems like there’s a purpose there and it’s not unnecessary, which is basically inherently selfish.</p>
Visible	
Time 1	
	[I dislike] the lack of privacy

	Still adjusting with little privacy at desk and find myself easily distracted. Collaboration rooms are a help but often need to be at desk with phone, files and two screens, etc.
Time 2	<p>I don't like how exposed certain desks are to those walking past</p> <p>I really struggle with the lack of privacy and space sometimes</p> <p>[I dislike] when people can view your monitors when they walk by and see confidential information.</p> <p>[I dislike] The level of noise and lack of privacy</p> <p>[I would change] more privacy for the co-lab rooms</p>

4 Discussion

Overall, almost all employees who responded to the survey expressed satisfaction with the new office environment. Positive outcomes relating to aesthetics, collegiality and communication were achieved, largely through good technical design. There were high levels of consultation throughout the change process, resulting in a thorough ergonomic assessment of the needs of employees as well as the requirements of their tasks. Initial egalitarian allocation of spaces meant that all desks were the same, regardless of whether the occupant was a senior partner or the most junior law graduate. When specifically asked about what they didn't like or what they would change, respondents at time 1 were mainly concerned with distraction and needing more storage. There were comments about difficulties in concentration, an issue also frequently identified in prior research (e.g., Banberry & Berry, 2005; Haapakangas et al., 2018; Vassie & Richardson, 2017). At 20 months post-move most occupants remained positive in their overall assessment of the space though, with an increased concentration of desks in some areas, crowding and a degree of inequity of desk allocation had, perhaps unsurprisingly, emerged as issues. Related to this, there was a somewhat prescient comment from a lawyer who was interviewed at time 1, who stated,

HM: It would be interesting to see what it's like when more people come in, because I think that it's good now, but if you tried to pack in a few more then that could get a little bit crappy.

Researcher: Are there plans to increase the size?

HM: Well, I think optimistically, if our team continues to build its business, then we will need more people at some point, and I understand that the space was designed so that you could pack in more people, put in extra desks and that kind of thing. So I think right now it's pretty good. It would be interesting to see what happens when it's fully utilized.

While most respondents were generally positive about the numerous plants, this attitude was by no means universal in this office. To date, findings on the “greening” of work spaces

either suggests minimal impact (Bringslimark *et al.*, 2009) or a generally positive response (Adachi *et al.*, 2000; Lohr *et al.*, 1996), so a finding that some workers identified plants as something they would remove and were bothered by, is new to the literature. This suggests that adding numerous plants should be done with caution, ensuring that long term care of the greenery is undertaken to reduce the negative outcomes such as insects and dead foliage.

A striking gender difference was found whereby female (but not male) workers in this environment described being observed; reporting feeling both “more accountable” and “exposed”, and changed their work-related behaviour accordingly. This links with recent research by Hirst and Schwabenland (2018), finding that women in an open-plan work environment engaged in “detailed self-scrutiny and self-management” (p. 173), altering both their behaviour and style of dress in response to being more visible. Whether or not female workers were actually being observed more than their male counterparts in this office (research on women’s experience of the “male gaze” would suggest that they may have been (see for example; Calogero, 2004; Gervais *et al.*, 2013; Moradi and Huang, 2008)), there is little doubt that they perceived that they were.

There are two likely contributions to female employee’s awareness of being visible. The first, as above, stems from these women accurately perceiving themselves to be watched and monitored in the open space. The second relates to objectification theory (Fredrickson and Roberts, 1997; Gordon, 2008; Moradi and Huang, 2008), which is an integrative framework of women’s socialization and lived experiences of objectification. This theory is generally applied in the context of mental health risks (explaining why women and girls are disproportionately affected by depression and eating disorders). In addition it posits that, both through their lived experiences and their exposure to media (Gordon, 2008), women and girls firstly learn that they are “objects to be looked at and evaluated” and secondly, will internalize an “observer’s perspective” as their own view of their physical selves (Fredrickson and Roberts, 1997; p. 177). This suggests that women are almost always aware of being observed in a way that men are not, simply because their life experiences have routinely included instances of objectification (Moradi and Huang, 2008).

The notion that women are socialized to be conscious of their appearance is certainly not new. Fredrickson and Roberts (1997) outline a disturbing list of research findings demonstrating how a woman’s appearance can determine her life experiences. The benefits that attractive women receive include everything from social mobility and educational attainment to college admissions. The physical attractiveness of women correlates more highly

with popularity and marriage opportunities than the attractiveness of men (Clarke and Griffin, 2008; Margolin and White, 1987). Obesity has been found to negatively affect women's, but not men's, social mobility (Rothblum *et al.*, 1990; Wooley *et al.*, 1979) and women rated as being unattractive (or unfeminine) by their colleagues are more negatively evaluated than comparably unattractive men (Fiske *et al.*, 1991; Weichselbaumer, 2004).

Thus, given that women's "life benefits" (Fredrickson & Roberts, 1997, p. 177) are, at least in part, determined by their appearance, it is not surprising the female employees in the current study were comparatively more aware of their visibility. Thus, this particular gender difference has less to do with biological gender *per se*, and more to do with the differential socialisation these employees have probably experienced in their lives to date, and with the different social status held by women and men in society in general (Fredrickson and Roberts, 1997).

While many of the women did not see their increased visibility as a negative aspect of open-plan work, and some felt it improved their productivity, the fact that this was an outcome that was disproportionately affecting female employees is an important finding. The notion that the male worker (seemingly both unconcerned with, and unaware of, being visible) is often considered the "norm" in work research (Boyle, 2002), no doubt contributes to the fact that there is scant research looking at possible gender differences in the way workers react to office layouts. One exception is a study by Bos (2017) suggesting that males tend to respond more positively to open-plan spaces than their female colleagues. Perhaps the notion that women experience themselves observed in a way men do not, contributes to this.

5 Limitations and directions for future research

A key limitation of the current study is the lack of generalizability afforded by the research design. However we would argue that, while the case study design may be seen to lack generalizability, the type of organization studied (professional services) is almost ubiquitous globally, and the findings from this study could reasonably be applied, not only to other law firms, but also to financial advisers, advertising professionals, accountants, engineers, architects, and consultants.

Most, if not all, of these types of organizations maximize profitability by paying junior employees a relatively low salary (when compared to senior members of staff). These workers accept lower pay, both because they want to gain experience, but also to have the opportunity to work closely with senior partners to learn their trade and acquire valuable knowledge from

them. The professional services context is one of the few where open-plan workspaces may genuinely benefit workers, particularly junior ones (indeed, this notion of learning from the partners came through strongly in the responses from junior staff in the current study). Thus, we would argue that the professional services context is an ideal one to describe best practice in terms of open-plan work. However, given that open-plan environments are now a feature of a wide range of organizations and industries, further research into open-plan spaces, as they are applied to organizations less obviously suited to the open-plan office, is also needed.

Another direction for future research is to explore further the differential impact that increased visibility has on diverse office workers. There are numerous dimensions along which workers differ from one another that might contribute to unease at being constantly “on display”. While we found that women were more aware of their visibility it makes sense that (for example) obese, transsexual, or disabled workers, or those wearing religious garb such as hijab or turbans in a Western context, might also be comparatively more impacted than those who are able-bodied, cis-gendered and of the dominant culture.

6 Conclusion and Implications

Prior research suggests that employee wellbeing outcomes are generally better in individual offices or when sharing with just one or two others. However, by following ergonomic principles and by consulting with staff to assess both their psychosocial needs and job requirements, organizations can ameliorate many of the negative consequences associated with these environments and create open-plan offices that are ‘safe by design’. While the spontaneous, unstructured interaction between employees afforded by open-plan environments can be functional (such as hearing important pieces of information about a case, being able to offer assistance, and peer learning), it is vital that employees also be afforded opportunities for quiet, concentrated work and privacy, as they are in the current study. The finding that women report feeling observed, but men do not, has implications for the relatively different impact open-plan work spaces may have on female compared to male employees. Thus, an awareness of the perceptions of being observed that female compared to male employees have, should be acknowledged and incorporated into office design. The norms of presenteeism (Johns, 2010) that have emerged in this firm will likely exacerbate any negative effects of being observed and, it seems, may disproportionately affect female workers. Giving female staff members the option of being closer to amenities, not having walkways directly behind their workstations, and/or increased privacy screening could be prioritized within such offices. In addition, explicit

policies allowing for remote work or flexi-time would contribute to reducing presenteeism within open-plan organizations.

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8 Appendices

8.1 Appendix 1. Images of the open-plan office

Used with permission of organization and architect/interior design company used. Photo credit: Sam Harnett photography (www.samharnett.com)

(see additional files)

8.1.1 Lunch area

8.1.2 Collab meeting room a and b

8.1.3 Atrium

8.1.4 Desk showing storage cupboard

8.1.5 “Green wall” dividers

8.1.6 Library a and b

8.1.7 Pod of desks a and b

8.1.8 Single desk set up

8.1.9 Foyer

8.1.10 Conference room

8.1.11 Floor plan (from architect / interior designer)



8.2 Appendix 2: Questionnaire items

Data were collected anonymously online, via mobile device or computer.

Demographics:

1. Is your role (Partner Lawyer Corporate services)
2. Gender (Male Female)
3. Age
4. (Time 1) Were you at [FIRM] prior to the office move, while the firm was based in [STREET 1]? (yes, no)
4. (Time 2) How long have you worked in [FIRM's new] offices?
 - Less than six months
 - More than six months (but I joined [FIRM] after the move to [STREET 2])
 - I moved to [STREET 2] from the [STREET 2] office in March 2016

1-10 rating scale answers:

Answer questions below thinking about your experience in [FIRM's new] office:

5. How much do you like your current work space? (1 = not at all, 10 = love it)
6. How much do you like the offices in general? (1 = not at all, 10 = love it)
7. How satisfied are you with the amount of privacy you have at your desk? (1 = extremely dissatisfied. 10 = extremely satisfied)
8. How high (typically) is your level of distraction while at your desk? (1 = no distractions, 10 = extremely distracted)

Open ended questions:

9. How has the new office impacted your work or your collegial relationships (if it has)?
10. How does the open-plan office design impact your productivity (if it does)?
11. What aspects of the office space or facilities do you especially like?
12. What aspects of the office space or facilities do you dislike?
13. If you could alter any aspects of your office space what would they be? (enter NA if you have nothing to add)

8.3 Appendix 3: User interface (mobile phone)

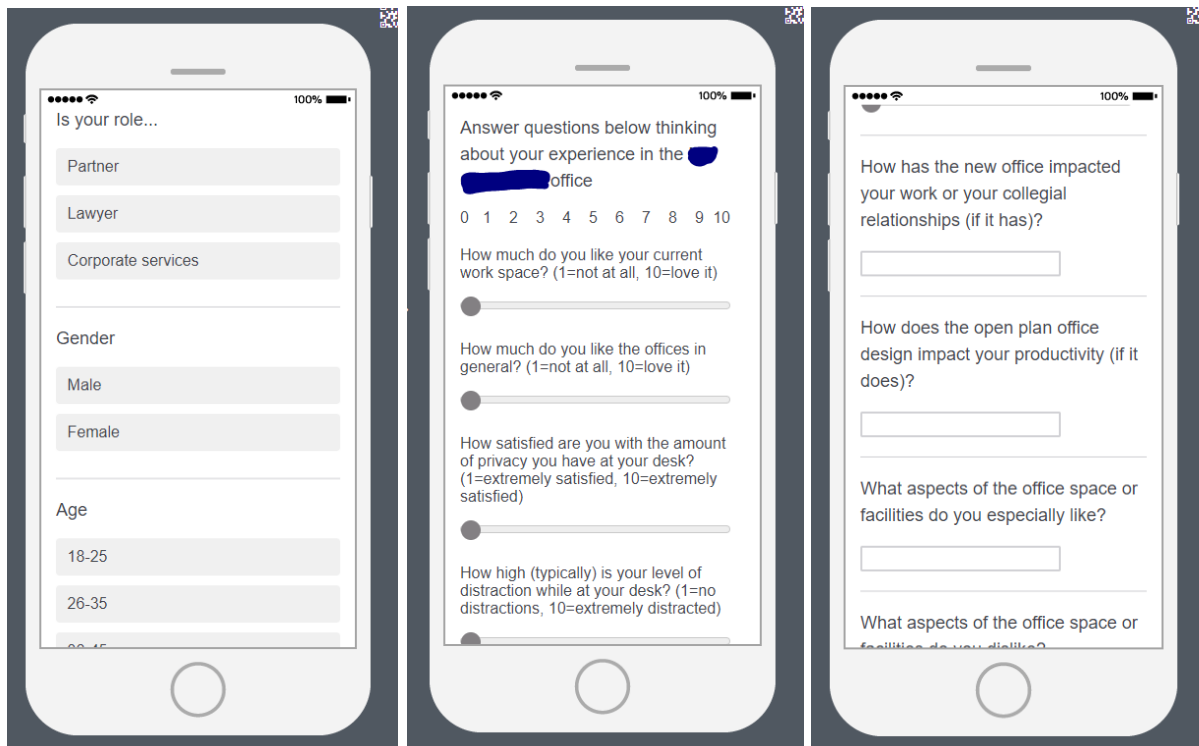


Figure 2: The user interface of the demographic, rating scale and open ended questions.



811 lunch area



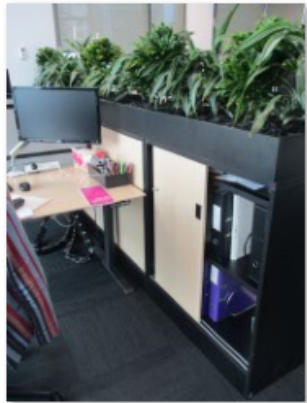
812 collab meeting room a



812 collab meeting room b



813 Atrium



814 Desk with storage cupboard



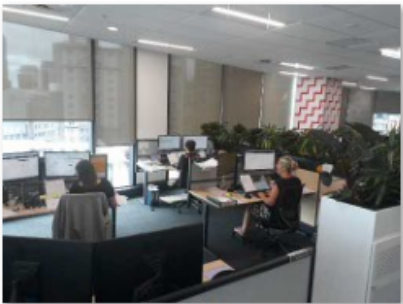
815 green wall dividers



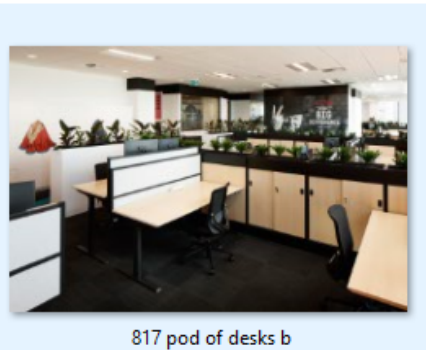
816 library a



816 library b



817 Pod of desks a



817 pod of desks b



819 foyer



819 Single desk set up



8110 conference room