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Abstract

Purpose

This explorative study examines location preferences of knowledge workers in the context of hybrid working. Despite the popularity of hybrid working in popular and academic discourse, it remains unclear who wants to work from home, the office, or other locations and in what proportion.

Approach

Drawing on survey data collected among 9,799 knowledge workers from Dutch public organisations during 2023, this study explores hybrid workers' location choices, work activities, workplace satisfaction, demographics, and work-related aspects.

Using Ward's Agglomerative hierarchical cluster analyse, six distinct location of work clusters were identified. Differences between the clusters were uncovered with a Chi-Square test and ANOVA.

Results

This study underscores a significant shift towards flexible working, with 64% of employees working outside the office. It identifies six distinct location choice clusters. The results indicate that individual flexibility enables workers to align their location choices better with task demands. Known challenges such as privacy concerns and insufficient support for focused work are being addressed by the mainly home and regular workers clusters. However, the results also highlight that all activities are performed by workers in all clusters, emphasizing the ongoing need to provide workplaces that facilitate both focused work and social interaction.

Value

This study provides insights in the decision patterns of knowledge workers in the context of hybrid working. This helps organisations balance individual preferences of workers and organisational goals. The clusters facilitate meaningful discussion surrounding collective (team)agreements and the design of the office space. Future research implications for strategic staffing decisions and workplace optimisation are discussed.

Keywords

Location of work, Cluster analysis, Work activities, Workplace satisfaction, Work-related aspects

1 INTRODUCTION

Teleworking is defined as a way of working in which the knowledge worker spends parts of the working time away from their office (e.g. at home or elsewhere) and uses ICT tools to collaborate with others (Allen et al., 2015). What distinguishes hybrid working from earlier ways of teleworking, is that the choices individual workers make has been given more weight (Nenonen & Sankari, 2022). Another characteristic is the scale at which workers can now perform their work outside the office. Digitization in response to COVID-19 have accelerated the shift to remote working (Babapour Chafi et al., 2022). Nonetheless, many of the previously identified advantages and disadvantages of teleworking remain relevant. Benefits include an improved work-life balance, flexibility and an increased (perceived) productivity. Professional isolation and spontaneous knowledge sharing are often posed as disadvantages (Allen et al., 2015; Brijn et al., 2022; Babapour Chafi et al., 2022; Nenonen & Sankari, 2022; Van Breukelen, 2021).

In both popular discourse and academic literature, hybrid working has gained considerable attention. Previous efforts have aimed to align workers with their work environment (Hoendervanger, 2021). Yet it remains unclear to organisations which workers prefer to work from home and in which proportions, and which activities should then mainly be facilitated in the office (Appel-Meulenbroek et al., 2022; Colenberg & Keyson, 2021). This is further complicated by the fact that knowledge workers may not be seen as a homogeneous group, with the same activities and work patterns (Greene & Myerson, 2011). Recent studies also suggest that hybrid working experiences vary among workers (Miglioretti et al., 2023; Peñarroja, 2024). With an increased emphasis on individual preferences, a one-size-fits-all environment seems less relevant (Babapour Chafi et al., 2022).

It is expected that some workers will be more office-based, while others will work more location independent. To effectively meet the needs of hybrid workers, workplaces should provide both quiet spaces for privacy and social areas for interaction (Colenberg et al., 2022). While accommodating to individual worker's needs may be challenging, clustering workers based on similar location choice patterns can be beneficial. These insights help organisations strike a balance between meeting individual needs and achieving collective goals. Therefore, in this paper, the choices made on the location of work for hybrid working are used to create clusters and check whether distinguishing characteristics between these clusters are visible.

Research questions are:

RQ1: *What location choices do hybrid knowledge workers make?*

RQ2: *Are there any distinguishing characteristics between clusters of knowledge workers with similar location choices?*

2 Hybrid work

Hybrid workers have the flexibility to choose their location of work. Thus, clustering workers based on their location choices seems insightful. Greene and Myerson (2011) offer a solid framework in this regard, identifying four distinct groups based on their interaction with the physical work environment: two clusters of office-based workers (*anchor* and *connector*) and two clusters primarily operating outside the office (*gatherer* and *navigator*). Building upon these insights, hybrid workers interaction with diverse locations are incorporated in this paper, with the expectation to discover distinct choice patterns, related to distinguishing worker and work characteristics. In their recent study, Appel-Meulenbroek et al. (2022) outlined various characteristics of knowledge workers that may influence their location choice. To differentiate between the identified patterns, relevant characteristics of workers are examined across four categories: work activities, workplace satisfaction, demographics, and work-related aspects. Below is argued which variables can be expected to matter and why.

2.1 Work activities & Workplace satisfaction

Knowledge workers are frequently clustered based on their activities. This approach is related to the principles of activity-based working (ABW). ABW prescribes workers to choose a workspace that best aligns with their current tasks. The physical environment is designed to accommodate various activities (Duffy, 1997; van Meel, 2019).

User experiences with ABW vary, with some encountering challenges such as privacy issues and inadequate support for concentrated work. In the light of hybrid working, it is expected that experiences with ABW will overall improve (Hoendervanger, 2021). Workers now have the flexibility and autonomy to perform concentration tasks at home and use the office for collaborative work if they want (Colenberg et al., 2022). Hybrid working enables workers to consider which activities warrant office presence for them. The ABW perspective therefore remains relevant in identifying patterns of choice.

Hoendervanger (2021) demonstrates that the experience with the work environment depends not only on individual work patterns, but also on characteristics of the work environment. Dissatisfaction with aspects of the office work environment influence location preferences, also confirmed by Babapour Chafi et al. (2022). Furthermore, other studies (Nakrošienė et al., 2019; Peñarroja, 2024) indicate that having a suitable home workspace can increase the likelihood of working from home. Consequently, satisfaction levels with various aspects of both home and office work environments are examined.

2.2 Demographics & Work-related aspects

Research indicates that personal characteristics influence teleworking experiences (Allen et al., 2015) and location preferences (Appel-Meulenbroek et al., 2022). Ollo-López et al. (2020) discovered that individuals with higher education levels were more likely to work from home frequently. Gender is also a notable factor, as argued by Singh et al. (2013). They found that women are more inclined to telework than men. Furthermore, Nakrošienė et al. (2019) observed that younger workers tend to favour teleworking more compared to their older colleagues.

Differences based on age can offer valuable insights into work behaviour (Deprez et al., 2015) and preferred work location (Singh et al., 2013). However, it is crucial to consider these differences within the context of the organisation (Joshi et al., 2011). When grouping workers based on their personal characteristics, it is essential to not only consider age but also factors such as job function and years of service (Stassen et al., 2016). Variables like the amount of work hours per week (Singh et al., 2013) and commuting time (Ollo-López et al., 2020) should also be considered as they may influence work location preferences.

3 Method

3.1 Participants

With a specifically designed survey complete responses from 9,799 knowledge workers in Dutch public organizations were collected during the second half of 2023.

In this sample, gender was equally divided. The mean age was 48.23 years (*SD* = 11.27 ±), and 38% held a bachelor's degree, 38% a master’s degree, and 18% an associate degree. On average, participants allocate their 34.8 (*SD* = 4.26) weekly working hours as follows: 36.8% at their primary office location, 51% from home, 4.7% while traveling, 4.8% at another organizational site, and 2.5% at various external locations, including client sites and public spaces.

3.2 Measurements

Locations of work. Participants were asked to distribute their weekly working hours as percentages (totalling 100%) across five distinct locations (see above).

Work activities. Participants were asked to distribute their weekly working hours as percentages (totalling 100%) across six activities (CfPB activity taxonomy, Niekel et al., 2022) to include the following items: general and routine work, focused individual work, active collaboration with colleagues,

scheduled meetings (including video meetings), unscheduled meetings (including video meetings), and telephone calls.

Workplace satisfaction. The levels of satisfaction were measured using a five-point Likert scale (5 = *very satisfied*) for both the office and the home environment. Five aspects were adopted from the WODI light questionnaire (Maarleveld et al., 2009) and measured: **"**psychosocial (6-items, α =.830)", "physical (5-items α =.800)", "architectural (2-items, α =.670)", "facilities (3-items, α =.700)" and "spatial (5-items, α =.850, solely for the office)".

Demographics. Gender (male/female/other), level of education (five categories), and age (five categories starting at 18-30).

Work-related aspects. Managerial role (yes/no), average commuting time (six categories from "0-15 min" to "more than 90 min"), years of service (interval), and working hours per week (interval).

3.3 Statistical analysis

For RQ1, Ward's Agglomerative hierarchical cluster analysis was utilized to explore workers location choices, benefiting from its capability to handle clusters of varying sizes effectively (Jaeger & Banks, 2023). The authors chose to start the clustering with seven clusters and limit the procedure to three clusters. In the interpretation of the dendrogram results, the Dunda-Hart stopping rule is combined with the Squared Euclidean Distances (d^2) (Jaeger & Banks, 2023). The last step of the procedure is comparing the stopping rule ratios with two criteria. Firstly, the number of clusters must be sufficiently recognisable to individual workers and teams in terms of location of work diversity. Secondly, the cluster sizes must be large enough to be relevant for policymaking.

For RQ2, Chi-Square tests examined the relationship between the location clusters and nominal variables, while ANOVA investigated the relationship with ratio variables. A stricter alpha value (.001) was applied due to the larger dataset. Cohen's (1988) effect sizes were employed for both analyses, with post hoc procedures conducted only when effect sizes (η_p^2 and Cramer's V) exceeded medium thresholds (Cramer's V: 0.13-0.22 for degrees of freedom > 5; η_p^2: >0.06). Small effect sizes that were almost in the medium effect range were also reported for exploratory purposes.

4 Results

4.1 Location of work clusters

The researchers interpreted the results derived from the dendrogram and identified six distinct clusters of work locations (C1-C6, see Table 1). The procedure showed that six clusters is both statistically and practically recognizable and relevant for policymaking. The Dunda-Hart stopping rule ratio is highest at six clusters. Using fewer profiles resulted in the disappearance of the 'travelling worker', which is both recurrent in previous literature (Greene & Myerson, 2011; Nenonen & Sankari, 2022) and highly relevant in the context of hybrid working.

Table 1. Location of work clusters

	C1 Mainly home worker	**C2 Regular home worker**	**C3 Traveling worker**	**C4 Home-office worker**	**C5 Regular office worker**	**C6 Mainly office worker**
n	*2747* (28%)	*2201* (22%)	*1352* (14%)	*1974* (20%)	*1129* (12%)	*396* (4%)
At the own office (base location)	17%	26%	31%	**49%**	**68%**	**91%**
On the way, traveling (non-commuting)	3%	6%	14%	2%	5%	2%
At home	**78%**	**57%**	31%	**47%**	22%	4%
At another location of the organization	2%	8%	15%	1%	4%	2%
At another location (including at clients or public places	1%	3%	9%	1%	2%	1%

Note: the bold percentages indicate the preferred locations per cluster.

Table 1 (RQ1) illustrates that most respondents fall into the clusters of mainly home worker (28%) or regular home worker (22%). 15% of the workers fall in the mainly or regular office worker clusters. These clusters highlight the diversity in preferences and tendencies regarding individual choices of work locations.

4.2 Differences in work related aspects between the location of work clusters

Tables 2 and 3 showed that work related aspects characteristics differ between the work location clusters (RQ2). The analyses showed that managerial role and average commuting time (see Table 2) vary between workers with different location choices.

Workers in the mainly office worker cluster, regular office worker cluster and traveling worker cluster are more likely to have a managerial role in the organization compared to workers in the mainly home worker, regular home worker and the home-office worker clusters, $p = .001$ (see Table 3).

Workers in the mainly and regular office worker clusters have a shorter commuting time to the office (0 - 30 minutes) compared to workers in all the other clusters, $p < .001$. On the contrary, workers in the mainly home worker, regular home worker and the traveling worker clusters were more likely to have a commuting time of 60 minutes or longer compared to the regular office worker and the mainly office worker, $p < .001$ (see Table 3).

Table 2: Location of work clusters Chi-square test statistics

Characteristics	χ^2	***df.***	***sig.***	***Cramer's V***
Demographics				
Gender	46.442	5	<.001	0.070
Age group	198.674	20	<.001	0.072
Household composition	91.619	25	<.001	0.044
Level of education	223.771	25	<.001	0.080
Work related aspects				
Managerial role in the organization	393.806	5	<.001	0.206**
Average commuting time	537.020	25	<.001	0.106*

Note: **the effect size exceeds the threshold, differences between clusters were reported in Table 4. * = are small effect sizes.

Table 3. Differences between the location of work clusters and the nominal variables

Characteristics	**Mainly home worker**	**Regular home worker**	**Traveling worker**	**Home-office worker**	**Regular office worker**	**Mainly office worker**
Role in the organization						
Manager	2%	6%	**15%**	8%	**18%**	**16%**
No manager	98%	94%	86%	92%	82%	84%
Average commuting time						
0-15 minutes	8%	9%	6%	11%	**16%**	**20%**
16-30 minutes	21%	18%	19%	24%	**29%**	**34%**
31-45 minutes	20%	19%	22%	23%	25%	19%
46-60 minutes	20%	20%	22%	20%	18%	18%
61-90 minutes	**20%**	**22%**	**23%**	17%	9%	7%
More than 90 minutes	**12%**	**12%**	9%	5%	2%	2%

Note: the bold percentages indicate clusters that significantly differ from the non-bold percentages.

4.3 Differences in work activities and satisfaction with the work environment between the location of work clusters

Tables 4 and 5 showed that work activities and work environment satisfaction levels differ between the work location clusters (RQ2) (see Table 4).

Workers in the mainly home worker cluster evaluate the psychosocial aspects and the facilities at home in a more positive manner compared to all the other clusters, p = < .001 (see Table 5). Mainly office workers and regular office workers perform more "actively collaborating with colleagues" activities compared to workers in the mainly home worker cluster and regular home worker cluster, p = <.001. Workers in the mainly home workers and regular home workers clusters perform significantly more individual focused work compared to workers in the other clusters, p = <.001 (see Table 5).

Table 4: Location of work clusters ANOVA test statistics

Characteristics	***F***	***df.***	***sig.***	η_p^2
Work related aspects				
Years in service	35.302	5	<.001	0.018
Hours of employment	22.676	5	<.001	0.011
Work environment satisfaction levels				
Psychosocial aspects at home	188.610	5	<.001	0.088**
Psychosocial aspects at the office	104.398	5	<.001	0.051*
Physical aspects at home	77.436	5	<.001	0.038
Physical aspects at the office	32.261	5	<.001	0.016
Architectural aspects at home	50.296	5	<.001	0.025
Architectural aspects at the office	29.846	5	<.001	0.015
Facilities at home	75.119	5	<.001	0.062**
Facilities at the office	29.846	5	<.001	0.015
Work activities				
General and routine work	48.430	5	<.001	0.024
Focused individual work	104.223	5	<.001	0.051*
Actively collaborating with colleagues	126.054	5	<.001	0.060**
Scheduled meetings	62.722	5	<.001	0.031
Unscheduled meetings	53.484	5	<.001	0.027
Telephone calls	4.054	5	<.001	0.002

Note:** = the effect size exceeds the threshold, differences between clusters were reported in Table 5.
* = are small effect sizes.

Table 5. Differences between the location of work clusters on the continuous variables

Characteristics	Mainly home worker	Regular home worker	Traveling worker	Home-office worker	Regular office worker	Mainly office worker
Work environment satisfaction levels						
Psychosocial aspects (home)	*M = 4.64, SD = 0.45*	*M = 4.55, SD = 0.52*	*M = 4.40, SD = 0.58*	*M= 4.43, SD = 0.56*	*M = 4.20, SD = 0.68*	*M = 3.98, SD = 0.79*
Psychosocial aspects (office)	*M = 2.81, SD = 0.70*	*M = 2.92, SD = 0.71*	*M = 3.09, SD = 0.73*	*M = 3.09, SD = 0.71*	*M = 3.24, SD = 0.73*	*M = 3.36, SD = 0.69*
Facilities (home)	*M = 4.33, SD = 0.68*	*M = 4.18, SD = 0.74*	*M = 4.01, SD = 0.80*	*M = 4.07, SD = 0.75*	*M = 3.83, SD = 0.83*	*M = 3.56, SD = 0.93*
Work activities						
Focused individual work	*M = 30.36, SD = 21.03*	*M = 27.60, SD = 16.95*	*M = 21.71, SD = 13.17*	*M = 24.04, SD = 15.31*	*M = 20.39, SD = 13.72*	*M = 17.88, SD = 13.74*
Actively collaborating with colleagues	*M = 11.22, SD = 8.57*	*M = 14.03, SD = 9.01*	*M = 17.38, SD = 10.72*	*M = 15.72, SD = 9.71*	*M = 17.60, SD = 11.48*	*M = 18.69, SD = 15.01*

Note: *M = mean, SD = standard deviation*

5 DISCUSSION AND CONCLUSION

5.1 Discussion

Based on the distribution of working hours across six different locations, six distinct clusters were identified from mainly home worker to mainly office worker, with varying grades in between.

Differences between early cluster findings of Greene & Myerson (2011) underscores the shift towards flexible, hybrid working, with 64% of workers predominantly working outside the office. With greater autonomy in choosing the work locations, the added nuance of six clusters proves to be advantageous. Furthermore, this study underlines the need for organisations to reassess internal knowledge sharing. While Greene & Myerson (2011) describe their office-based workers as the primary source of information within organisations for colleagues to go to, this study indicates that only 16% of workers currently fall into this cluster.

Focusing on the characteristics of the six clusters, this study revealed different distinguishing factors. Regarding *work activities*, this study found that workers engaged in focused tasks are predominantly clustered in the home-based clusters. This suggests that a significant portion of concentrated work is now more frequently carried out from home, in contrast to the findings of Greene & Myerson (2011). It indicates that individual flexibility enables workers to align their location choices better with task

demands. Known challenges such as privacy concerns and insufficient support for focused work are being addressed by workers through remote working. However, the results also highlight that all activities are performed by workers in all clusters, emphasizing the ongoing need to provide workplaces that facilitate both focused work and social interaction, as suggested by Colenberg et al. (2022).

It was found that *workplace satisfaction* is another important factor. Workers who primarily work from home, tend to perceive their home environment more positively in terms of psychosocial factors, physical aspects, and facilities compared to those who frequently work at the office. Thus, having a suitable home workspace increases the frequency of remote work (Nakrošienė et al., 2019; Peñarroja, 2024).

On the other hand, *personal characteristics* (gender, age, education level, and household) seem to have a limited impact on location preferences, contrary to previous findings (Appel-Meulenbroek et al., 2022; Delbosc & Kent, 2024; Moens et al., 2022; Nakrošienė et al., 2019; Nguyen, 2021). Although older workers show a greater inclination to work from home, no significant differences in gender, household, or educational levels were found.

Work-related aspects seem to have some impact, however. Those primarily working in the office typically have short commute times compared to remote-base workers, consistent with prior studies (Ollo-López et al., 2020).

5.2 Limitations

One limitation is that the dataset is exclusively composed of Dutch hybrid workers from Dutch public organisations. This may restrict the generalizability of findings to broader populations. While the sample size is substantial, it is necessary to exercise some caution when extrapolating the identified clusters to contexts beyond the Dutch public sector. Cultural and international differences potentially account for the observed absence of significant differences in gender, levels of education, and hours of employment.

Additionally, the Ward's hierarchical clustering is computationally intensive and sensitive to outliers. Other clustering methods – such as K-means – are more efficient and less affected by outliers. However, the pre-specified clusters in other methods would have limited flexibility in data exploration, which was the focus of this study (Jaeger & Banks, 2023).

5.3 Practical implication and future directions

This study considers hybrid working as a precondition for knowledge workers, who now possess the autonomy to choose their work location. By addressing the diverse range of location preferences, organisations can effectively manage this unprecedented flexibility.

A challenge highlighted in our study is determining which activities need to be supported in the office. Our results indicate that employees desire to continue performing portions of all their activities on-site. Practitioners should, therefore, focus on how to best support different types of employees when they are in the office. This involves creating a balanced mix of open and enclosed spaces to accommodate both remote and office-oriented employees. Future research is needed to explore the fit between work activities and office spaces within the six location of work clusters.

Another key challenge stressed in this study is the heterogeneity of knowledge workers. Managers and teams could benefit from understanding the different location of work clusters. They are not an absolute representation of reality but facilitate discussions on preferences within the context of hybrid working. These insights aid in making informed collective decisions about work arrangements and collaboration among team members.

Future research should further explore the underlying motives and mechanisms that influence individual choices of work locations. Additionally, it is valuable to validate the identified clusters through qualitative research methods. This will enhance the practical recognition of these clusters and ultimately provide a comprehensive understanding of the diverse patterns of individual location choices within the context of hybrid working.

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