

What do knowledge workers actually do? A framework to develop a new taxonomy for knowledge workers' activities

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ABSTRACT

Activity based working environments (ABW) are supposed to facilitate various work processes and work patterns. Upcoming ways of working, such as Agile and experience with working from home during COVID-19, suggest that office buildings need to change to fit new trends. The experience with compulsory working from home has made people think differently about where they can perform their work activities. Employees indicate that they want to work from home more often. This is expected to lead to different activity patterns in the office, in turn leading to a host of subsequent questions. How were activities of knowledge workers defined precisely in the pre-COVID period? Does the partly changing location of knowledge work call for changed definitions of activities? Which new work patterns can be distinguished and what is their effect on possible adaptations of office buildings and other physical environments aimed to 'fit' the individual knowledge worker? A clear answer to these questions is crucial for making sure that the activity-based environment meets the requirements of knowledge workers. In this paper we focus on providing a framework for defining activities. With this way aim to start the discussion about the intricate post-COVID relation between worker, workplace and activity.

Keywords

Work patterns, Activities, Work environments, Activity-based working, Taxonomy, Knowledge work.

1 INTRODUCTION

In the first stage of the evolution of the office, work environments in office buildings were designed as 'white collar factories' (van Meel, 2000). In the course of the 20th century the ideas about the most suitable configuration of the office started to change. From the 1990's onwards, the leading idea became that offices should be configured in an 'activity-based' way, meaning that various workplaces should be designed in order to support various activities (Engelen, et al., 2019). During the first two decades of the 21st century, activity-based working (ABW)

became a highly popular theory, the ‘rise’ of which will not be followed (quickly) by a subsequent ‘fall’ (Leesman, 2017). The COVID-19 pandemic further strengthened the idea that it is possible to work at a variety of places, including home (Appel-Meulenbroek, Kemperman, Van de Water, Weijs-Perrée, & Verhaegh, 2022). The experience with working from home during the COVID-19 pandemic led to the idea that ‘hybrid’ ways of working – meaning: working partly in the shared office, partly elsewhere – can be applied in a more structural manner (Appel-Meulenbroek, Looijen, Hoekstra, Jongens-van der Schaaf, & Weijs-Perrée, 2021).

This development leads to a series of interesting questions. As the ruling flexibility-paradigm in offices is based on the notion of ‘activity’, it is – firstly – interesting to recapitulate how the different activities of office workers are defined and underpinned in theories about the activity-based workplace. Secondly, it is interesting to test whether these definitions of activities still meet the requirements in the post-COVID office. Does the (partly) changing physical environment for office work call for new definitions of the activities of office workers? Lastly, it may be worthwhile to rethink the actual translation of activities in the physical configuration of various activity based workplaces. Does the changing way of working urge practitioners to change the way in which they design offices and other places meant to support knowledge workers?

In this paper we aim not so much to provide definite answers to all these questions. Rather, our objective here is to provide some material on the basis of which this discussion can be started and carried on in a structured manner. In order to meet this aim, we will firstly elaborate on some of the existing classifications of activities and theories dealing with the alignment between individual office workers and workplaces (section 2). In section 3 we will treat some theories and ideas that have been put forth – or can be used – in order to provide a theoretically grounded taxonomy of the several activities that are (supposed to be) performed by knowledge workers.

2 ‘ACTIVITIES’ IN THE LITERATURE

2.1 Activities

The development of new offices and ABW-environments have received a lot of attention in the academic literature (Duffy & Powell, 1997) (Appel-Meulenbroek, Groenen, & Janssen, 2011) (Hoendervanger, 2021) (Van Meel, 2020) (Engelen, et al., 2019). In this context, various authors have written about activities. An often-used classification in this respect is the basic distinction between *individual* and *collaborative* activities (Drucker, 1996) (Duffy & Powell, 1997) (Duffy & Tanis, 1999) (Appel-Meulenbroek, Groenen, & Janssen, 2011) (Worthington, 1997) (Beckers, 1997)’ (Haynes, Suckley, & Nunnington, 2019). Some add more detail to this basic distinction, adding ‘a mixture of both’ to the concepts of ‘concentration’ and ‘communication’ (Appel-Meulenbroek, Kemperman, Van de Water, Weijs-Perrée, & Verhaegh, 2022) or using this basic bifurcation for a fivefold distinction ‘highly collaborative’, ‘collaborative’, ‘balanced’, ‘individual’ and ‘highly individual’ (Leesman, 2020). Still, it is clear that the basic distinction is upheld. A lot of distinguished activities by different authors (see table 1) can be divided in this basis distinction. Yet, the apparent agreement concerning this distinction is not to say that there are no divergencies in the different classifications of activities. Consider table 1:

Table 1. Distinguished activities by various authors

Author	Beckers (1997)	Fruytier (2002)	CfPB (2016)	Leesman (2017)	Measurement (2021)	Van Gelder et al. (2022)

Individual activities	Individual/process activities	Individual process activities	General deskwork	Individual routine tasks	Individual low concentrated work	Activities which need a broad focus
	Concentration work		Concentrated deskwork	Individual focused work, desk based	Individual high concentrated work	Activities which need a deep focus
	Individual work	Individual innovative/creative activities with a high difficulty level				Asynchronous activities
		Individual process activities outside the office				
	Outside of the office/account management (i.e. outside of the office meaning; working at clients etc, not teleworking)	Individual innovative/creative activities with a high difficulty level outside the office		Individual focused work away from your desk		
			Reading	Reading		
				Thinking/creative thinking		
			Telephone conversations /Calling	Telephone conversations		
	Management activities					
			Document management			
Group orientated activities	Group orientated work	Group orientated process activities				Synchronous activities
	Dynamic group work/project work	Individual and group orientated innovative/creative activities with a high difficulty level	Interactive deskwork	Collaborating on creative work		Activities which need a broad focus
				Collaborating on focused work		Activities which need a deep focus
	Outside of the office/account management (i.e. outside of the office meaning; working at clients etc, not teleworking)	Group orientated process activities outside the office				

		Individual and group orientated innovative/creative /management activities with a high difficulty level outside the office				
			Planned (formal) meetings	Planned meetings	Physical meetings	
				Larger group meetings or audiences		
			Unplanned (informal) meetings	Informal unplanned meetings		
				Informal Social interaction		
				Audio conferences		
				Hosting visitors, clients or customers		
				Video conferences	Digital meetings	
				Business confidential discussions		
				Private conversations		
				Learning from others		
					Hybrid meetings	
Other activities	Transactional work					
				Relaxing/taking a break	Taking a break	
				Spreading out paper or materials	Other	
				Using technical/specialist equipment or materials		

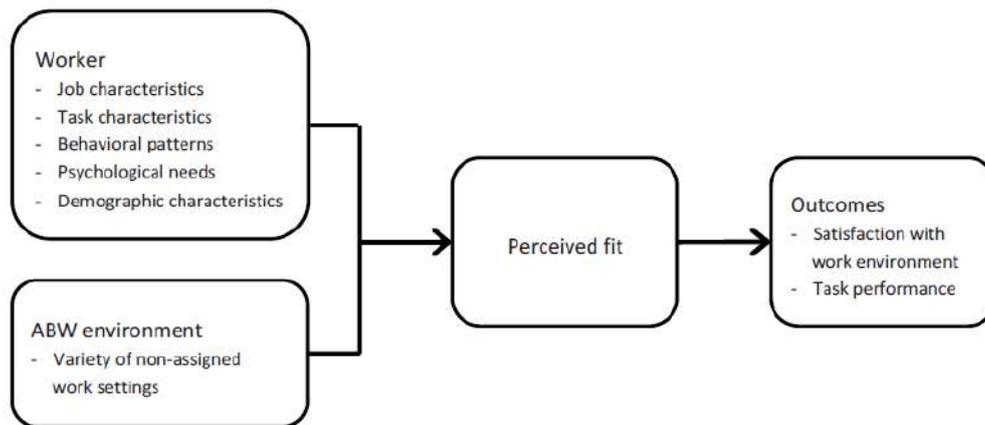
Table 1 shows that there is considerable divergence in the terms that are used in order to describe activities by office workers. There appears to be no clear and validated foundation for the terms used by various authors. Even though most of the activities mentioned are intuitively accurate, the terms lack theoretical clarity. Is the distinction between ‘individual activities’ and ‘collaborative activities’ indeed synonymous to the distinction between ‘concentration’ and ‘communication’? Is it really possible to distinguish between ‘concentration work’ and ‘group-oriented work’? Is ‘creative work’ necessarily different from ‘focussed work’? And what do

the distinguished activities mean for the configuration of the actual workplaces designed to meet the needs of knowledge workers?

2.2 P-E Fit Theory

An answer to this latter question may be provided by P-E Fit Theory. This theoretical perspective has contributed considerably to activity-based workplace design (Armitage & Nassor Amar, 2021). Still, it must be noted that activities play a relatively subdued role in P-E Fit Theory. Consider the following research model, designed by (Hoendervanger, 2021):

Figure 1. Research Model 'On Workers' Fit with Activity-Based Work Environments', (Hoendervanger 2021).



Hoendervanger is not blind to the importance of activities performed by the worker. But a fundamental analysis of activities is not provided (nor intended) in his thesis. The main concepts of the model are the *worker* and the *environment*. The concept 'activities' does not have the same conceptual status as either 'worker' or 'ABW environment'.

A similar stance can be recognized in the meta-analysis of person-environment interaction by Kristof-Brown et al. (2005). They analyse 'four critical domains of PE-Fit': person–job, person–organisation, person–group, and person–supervisor fit (Kristof-Brown, Zimmerman, & Johnson, 2005). The relation between worker and activity is not specified as a relevant unit of analysis.

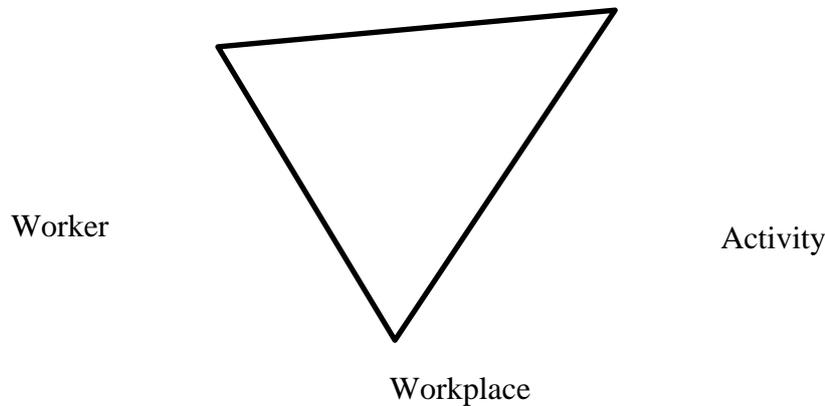
2.3 The activity-worker-workplace triangle

The relatively little attention paid to a systematic and validated classification of activities is somewhat surprising, considering the fact that the activity-based office carries the very term 'activity' in its name. This at least suggests that the definition of activities is crucially important for establishing a fit between person and environment. Indeed, the suitability of an activity-based workspace appears to depend on at least *three* equally important factors:

- 1) the fit between the worker and the various workplaces provided by the organisation
- 2) the fit between the worker and the activity
- 3) the fit between a workplace and the activity that is to be performed.

This basic idea can be expressed in the following way:

Figure 2. The activity-worker-workplace triangle



This triangle aims to convey that the concept ‘activity’ is crucially important in providing ‘fit’ between worker and workplace. Take for example a speed skater entering a hall with a swimming pool. It is clear that this particular workplace is only ‘fit’ for the worker if the activity the speedskater aims to perform is ‘swimming’. For indeed, if the intended activity is ‘speedskating’, the situation leads to results that probably would be defined as sub-optimal by the speedskater.

A similar example can be constructed for the case of a knowledge worker. Let us say that a knowledge worker who defines herself as a ‘design aficionado’ enters a beautifully designed lounge space in an office building. *Prima facie* the fit between the person and the environment appears to be optimal in this situation. However, one aspect was still left out of the equation here: the intended activity. If the knowledge worker intended to have nice conversations with her colleagues, the fit between person and environment could perhaps not have been better. But if it was her explicit aim to work on an important presentation that needs to be delivered tomorrow morning, the lounge area – well-designed as it may be – is clearly suboptimal for the task at hand.

A clear definition of what the intended activity amounts to is crucial for making sure that an activity-based environment meets the requirements of knowledge workers. This is all the more important in a context in which hybrid ways of working gain ground. As the growing popularity of hybrid working is expected to lead to a partial shift in the physical workplaces used by knowledge workers (Appel-Meulenbroek et al., 2022), it is necessary to critically (re)consider the activities which are likely to be performed by knowledge workers.

3 TOWARDS A NEW TAXONOMY OF ACTIVITIES

3.1 Activity Theory

In order to underpin the importance of designing a systematic taxonomy of clearly defined activities, it may be instructive to return to the example of the speed skater entering the swimming pool once more. Let us suppose that before visiting the swimming pool the speed skater makes a phone call asking the proprietor of the hall whether it is possible to visit the hall this afternoon in order to do some ‘sporting activities’. In this case the answer of the proprietor of the hall would probably be: ‘this is absolutely possible, as our hall is suitable for sporting activities’. Despite this valid answer, there still is the danger of a serious mis-fit. For if the speed skater intends to skate this afternoon, the fit between worker, workplace and activity

remains questionable. The designation ‘sporting activities’ was not precise enough to establish the fit between the worker and the workplace. Even though there may have been a good fit in terms of the four critical domains distinguished by Kristof-Brown et al. (2005), the P-E Fit in this example is not ideal. The fit between worker, workplace and activities requires a clear and well-defined division and subdivision of activities. In this respect Activity Theory (AT) provides a good guideline. AT is based on the idea that there is in fact a close connection between the conscious mind of the actor and the activity she aims to perform (Leont’ev, 1978) (Babapour, Cobaleda-Cordero, & Karlsson, 2021). In the context of this theory, ‘activity’ can be defined as ‘a goal directed system, where cognition, behaviour and motivation are integrated and organised by the mechanism of self-regulation toward achieving a conscious goal’ (Karwowski, 2004). Crucially, AT distinguishes three hierarchical layers: ‘activity’, ‘action’ and ‘operation’ (Leont’ev, 1978) (Babapour, 2019). Distinguishing these layers allows for a more detailed description of activities, enabling a suitable alignment between worker and workplace.

In the case of the speedskater, this subdivision can be made in the following way:

Activity: Sporting

Action: Speedskating

Operation: Creating a forward movement by putting force on ice

A similar subdivision can be made for the case of the knowledge worker, aiming to prepare a presentation. This particular activity can be subdivided tentatively in the following way:

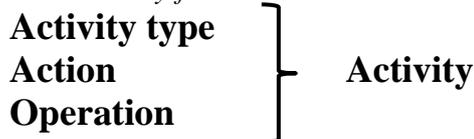
Activity: Individual work

Action: Writing

Operation: Making a report with clever remarks and attractive features

To be sure, this is only an example. The proper categories can only be established after empirical research. Moreover, in its present rendering, there is the danger of a conceptual mix up, as the term ‘activity’ appears to be somewhat equivocal: it can be used in order to designate two distinct concepts: the highest hierarchical layer in the proposed conceptual framework, *and* the hierarchical structure in its entirety. In order to prevent any possible conceptual mix up, the highest hierarchical layer in our framework will be denoted with the term ‘activity type’; the term ‘activity’ will be used as a general designation, comprising all hierarchical layers. Hence, we propose the following basic framework:

Figure 3. The activity-framework



3.2 An existing taxonomy

Figure 3 shows the skeleton (so to speak) of the framework we aim to present in this paper. Clearly, in order to fulfil its intended purpose – i.e. to provide the basis for developing a validated taxonomy of knowledge workers’ activities – this theoretical skeleton needs to be fleshed out. In this regard the report ‘A Taxonomy of Office Activities for Business and Education’ by Huffman et al. (1968) provides us with additional conceptual resources. In this report, Harry Huffman and his colleagues at Ohio State University aim to provide ‘systematic guidance for observing and analysing office activities, a common language for describing office activities, a basis for consolidating data from many locations and occupations, and a basis for writing performance goals’ (Huffman, Brady, Peterson, & Lacy, 1968).

Interestingly, the authors base their taxonomy on a classification of action verbs. They claim that ‘with a properly selected list of verbs, an all-inclusive list of office tasks and activities can be developed by adding nouns, adjectives, and phrases to the verbs’. (Huffman, Brady, Peterson, & Lacy, 1968).

The resulting taxonomy incorporates three different dimensions: the *operating* dimension, consisting of verbs which all centre around the idea of processing data; the *interacting* dimension, consisting of verbs which somehow express the idea of interaction with either people or the immediate environment; and the *managing* dimension, consisting of what they call ‘administering verbs’. These three domains encompass what the authors call ‘primary division verbs’, which describe a general activity (see table 2).

Table 2. Primary division verbs in three dimensions (Huffman, Brady, Peterson, & Lacy, 1968).

	Operating	Interacting	Managing
Primary division verbs	Arranging Calculating Collecting Comparing Composing Indexing Manipulating Modifying Purging Recording Storing Transmitting Verifying	Communicating Assisting Copying	Planning Organising Actuating Controlling

Apart from these ‘primary division verbs’, the authors distinguish so-called ‘secondary division verbs’, describing all forms of specific activity which can be grouped under the primary division verbs (see the examples in table 3 and 4).

Table 3. Secondary division verbs of action verb ‘arranging’ (Huffman, Brady, Peterson, & Lacy, 1968).

Primary division verb (Operating dimension)	Secondary division verbs
Arranging	Batch Collate Compile Sort Rank Other

Table 4. Secondary division verbs of action verb ‘communicating’ (Huffman, Brady, Peterson, & Lacy, 1968).

Primary division verb (Interacting dimension)	Secondary division verbs
Communication	Affirm Answer Canvass Consult Debate Demand Describe

	Detail Discuss Elicit Emphasise Explain Express Inquire Invite Listen Negotiate Page Persuade Question Quote Repeat Request Reveal Suggest Summarise Thank Other
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Several things come to mind with respect to this intricately designed taxonomy. Firstly, it cannot escape our notice that Huffman et al. (1968) distinguish hierarchical layers of activities. In this respect, Huffman's method meets our aims. As is clear from the proposed activity-framework (Figure 3), a new taxonomy of activities does not only provide a comprehensive list of singular operations, but also – and perhaps even more importantly – provides a grounded classification of these singular operations into more general groups of actions, which can in turn be grouped under comprehensive classes of activity-types. Another interesting aspect of the methodology used by Huffman et al. is their choice to use action verbs. Verbs express an activity, action or operation and can be enriched by using additional expressions so as to pinpoint what is meant specifically when describing and categorising a certain activity (Huffman, Brady, Peterson, & Lacy, 1968). This perspective appears to be very promising with respect to the aim to flesh out the framework proposed in figure 3. The advantages of their method may lead to the question why it would still be necessary to design a new taxonomy. Does it not suffice to make use of the taxonomy put forth by Huffman et al.?

There are good reasons to answer this question with 'no'. Firstly, this theory dates back to 1968. This taxonomy was designed in an age during which knowledge work, for obvious reasons, differed considerably from today's *modus operandi*. This has possible implications for the action verbs that are to be distinguished in order to denote operations, actions and activity types within our proposed activity-framework. Moreover, it can be doubted whether the general division in the operating, the interacting, and the managing dimension is still apt to describe and classify activities in the activity based office accurately. A second problem with the taxonomy of Huffman et al. (1968) is its complexity. As became clear with respect to the secondary division verbs in the class of 'communication', in certain cases the list of action verbs is so long that it is highly questionable whether the taxonomy still provides practitioners with the theoretical means on the basis of which they can design an environment which indeed fits the knowledge worker. Ideally, combined with the proposed activity-framework (figure 3), the method used by Huffman et al. (1968) leads to a new taxonomy which on the one hand clearly and unequivocally defines and describes all activity-types, actions and operations while

on the other hand provides practitioners with sufficient theoretical clarity and simplicity to translate the taxonomic theory into everyday practice.

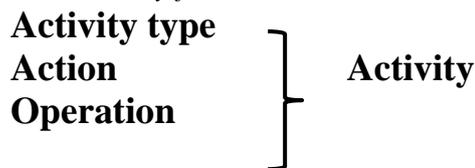
4 CONCLUSION

The activity-based office has developed into the leading principle in configuring offices. But remarkably enough no clear, unequivocal and up-to-date taxonomy of office activities can be found in the literature. Various authors and institutions have developed tenable classifications of activities. But these classifications lack a systematic empirical basis. Moreover the different classifications diverge considerably, leaving practitioners with relatively little substantive theoretical guidance in designing work environments which can be expected to fit the needs of knowledge workers. This problem becomes even more pressing now that organisations – due to the COVID 19-experience – expect a rapid shift in the use of work locations.

In order to provide practitioners with theoretical guidance we propose to design a new and systematically grounded taxonomy of knowledge workers' activities. In this paper we have provided a structured outline for a route to develop such a new taxonomy. This proposed route consists of two main elements: a systematic framework, and an empirical method on the basis of which the theoretical structure can be fleshed out.

Activity Theory served as an inspiration for the following systematic framework:

Figure 4. The activity-framework



The proposed way of fleshing out this framework is inspired by Huffman et al. (1968). Their taxonomy, consisting of hierarchical layers of action verbs, provides methodological inspiration for turning this theoretical construct into a practical tool – a new taxonomy of knowledge workers' activities – which can be used by practitioners to design and facilitate fitting activity-based environments.

5 LIMITATIONS AND RECOMMENDATIONS

In this paper we have presented a tentative framework with which it is possible to construct a new taxonomy of knowledge workers' activities. The goal of such a taxonomy is to provide practitioners with a systematic and unequivocal conceptual tool on the basis of which they are able design and facilitate environments for knowledge workers. Evidently, apart from a proposed framework and method, a lot more is needed before it is possible to present a full blown taxonomy. The lack of structured empirical data at this point is a clear limitation. Fleshing out the proposed framework in the indicated way requires considerable additional empirical study as well as a more detailed treatment of the indicated method.

Another evident – and deliberate – limitation of the present paper is the strict focus on activities. As was made clear in section 2.3, a satisfying fit between worker, workplace and activities is only possible if all three aspects are taken into account. So the focus in this paper does not imply that the other two factors of the activity-worker-workplace triangle (figure 3) – or indeed the knowledge developed in the context of P-E Fit Theory – are deemed to be less important.

A word on activity based working. Our present proposal for a new taxonomy is based on the observation that ABW is the leading principle in office-related work. However, this is not to say that this paradigm cannot be contested at all. The suboptimal fit between worker and workplace – often reported in the academic literature – may very well find its cause (partly) in

the fact that the ABW-principle is not (entirely) apt to satisfy the present and future needs of knowledge workers. Additional research – from various angles – is needed to provide a satisfying answer to this fascinating question.

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The Virtual Reality Workplace

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ABSTRACT

The paper conceptually debates the extent to which the adaptation of immersive virtual reality (“VR”) technology could enable employees to overcome the distractions associated with working from home, increase their visibility on team projects, build stronger relationships with co-workers, reduce feelings of isolation due to social distancing, and facilitate their engagement in collaborative work processes. VR as an emerging technology demonstrates a high potential to improve the effectiveness and job satisfaction of remote workers. The previous debates on the potentials of VR for optimal employee collaboration are limited, and as such, the following paper presents a ground-start for further research on the visually enhanced and immersive tools for remote working.

Keywords

Virtual Reality, VR, Workplace, Remote work, Remote collaboration.