New Work and Old Habits

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ABSTRACT

The purpose of this paper is to explore findings regarding the interaction between humans and architectural settings. Based on a cross-disciplinary literature review the topic is discussed with an evolutionary perspective. The concept of the non-territorial office and how people react to it serves as an example. The conclusion is drawn that most observations are based on behaviour settings developed over thousands of years. These settings are cast into instincts and unconscious behaviour helping mankind in the past to mitigate risks of the environment. However sociology, phycology, brain research, medicine, acoustic research, anthropology, and ergonomics all draw the same conclusion: We are poorly adapted to the modern environment we live in. Our brain and body are perfectly equipped for our natural habitat, but our natural habitat is nature.

That has implications for the way we should design architecture.

Architecture was so far formed within a context of physical and economical constraints, functional considerations and aesthetic ambition. We now understand that we missed an important point. Space as a mental and physical stimulator was more or less ignored (an example is Marquardt C., Veitch J., Charles K. 2002)

It will be shown how a non-territorial office concept does not take in account important aspects of human nature. How space is organized and designed has a much greater influence on us than previously expected. To understand the impact space, with all its elements, has on us is important. But it is also vital to discover how space should be designed in order to support our mental and physical needs.

This understanding is the first step towards a new approach to design and organize space. Just as an increasing number of organizations react to new organizational requirements with the implementation of innovative workplace models; it should be of great interest how to use space as a tool to improve people´s well-being and performance in order to support commercial objectives.
The paper should be seen as an attempt to touch on the most important issues.

KEYWORDS

Workplace, brain research, architectural psychology, productivity, well-being

INTRODUCTION

The background to this paper is a continuous research activity over the last three years beside my work as an architect and office strategist, making use of my earlier experience with hospital design and studies in sociology. The studies are motivated by the ambition to define how a state of the art office space would look today. The best information was surprisingly not found within current architectural theory, but in some rather unexpected field of science. The key idea to use a much earlier state of human evolution as a reference to understand current problems and phenomena of today, was found in an array of different fields of science, including brain research, sociology, phycology, medicine, anthropology, and biology.
By approaching the above question in a cross-disciplinary way ensures that formulated findings are not self-referential and the risk of misperceptions are reduced. A few hundreds articles, books and research papers taken in account over the course of the last years in pursuit to gain practical knowledge for an architectural design process. Only a fraction is used in this paper. A more detailed presentation needs to be part of a future documentation.

In part one of this paper findings concerning the concept of the non-territorial office are presented. Part two is the attempt to explain the observed behaviour.
In part 3 certain aspects of space and its effect on humans are discussed followed by part 4 with a brief overview of some research findings regarding spatial interventions and the observed reaction to it. A conclusion and valuation is the content of part five of this paper.

1. NON-TERRITORIAL WORKPLACES

Ideas and intellectual capital are the new keys within a creativity-based economy.
The new normal is change driven development enhanced by globalization and disruptive technologies.
The war on talent and the challenge of an aging workforce with various health problems makes it necessary to balance employees and business needs in a new way.
Therefore commitment, loyalty and performance have become an organization's business objectives.
This is usually the domain of business and organizational consulting. A large number of different methods claim to increase companies' performance. Change management is often introduced to alter people's behaviour and the way they work. The success rate of these interventions varies.
Workplace design and office layouts are increasingly seen as a complementary opportunity to change an organization in pursuit for greater efficiency.
Joyful environments at Google and other companies come to mind and a still increasing number of companies chose to introduce non-territorial workplaces. The later means that employees are supposed to choose a different workspace every day in order to be able to cut the number of desks and therefore the size of the office floor space.

It should be noted that non-territorial workplaces are not the same as activity based workplaces or hot desks. Activity based offices offer a variety of different work settings, but they are perfectly compatible with a personal desk concept. Hot desks provide a workplace for a short period of time, suitable for visitors and guests.
The expectation with a non-territorial workplace concept is not only to save costs but also to increase communication. Even the bridging of organizational borders between departments and a greater sense for the company as a whole is a desired outcome.
The extent of office space reduction is usually based on surveys of the desk utility rate. A great number of desks are often unoccupied which leads to the conclusion that there is potential to reduce the number of workplaces. This is a fully rational consideration.

However, despite sensible change management and the consent of the workforce, is it very likely that this office model, like many other management changes, does not work.
There are an increasing number of surveys showing the negative consequences of a non-territorial workplaces concept. (Augustin, S., 2009, Knight C. and Haslam S. A., 2010, Petendra B. 2013, Döös M, 2003, Härenstam A, 2010, Döös M., Johansson P. and Backström T., 2014)

But the reported positive results in conjunction with non-territorial workplaces shall not be disputed. But they are based on positive effects from elements like a more attractive design, new furniture and in some case the possibility to choose the work environment. The requirement to use a different desk every day is on its own rarely perceived as a positive. (Petendra B. 2013)

1.1. COMMUNICATIONS AND KNOWLEDGE

Employees are expected to get in contact with colleagues from different parts of the company by choosing a different workspace every day and in this way make new contacts and probably get new ideas. Research shows that the amount of new contacts and communication is indeed increasing. But the contact generated is between people hardly knowing each other and probably working with tasks, which are not interconnected. Conversations may be pleasant and interesting but they do stay naturally on a more formal level. A fruitful exchange of knowledge and ideas is only possible with a certain amount of trust between people that needs to grow over time. This aspect is paramount regarding the development of knowledge in a group. A large part of the knowledge inherent to an organization is implicit and therefore directly linked to established communication channels. A disturbance of these channels can cause a serious decline in performance (Schenkel, A. and Teigland, R., 2008, Probst G., Raub S., Romhardt K., 1999).

Being able to talk to understanding colleagues about negative work issues is even damping stress levels. The human need to be part of a social group cannot be overestimated. The stimulation of strong teams is rightly regarded as a valuable aim. But teambuilding takes time and requires continuous interaction between team members. This is hardly possible in an environment where social groups fluctuate on a daily basis.

1.2. PERSONAL SPACE

All offices with non-territorial workplaces report that people try to sit at the same place every day or that they are trying to limit the amount of places they use. That happens first by occupying a favorite desk and then by defending it with personal elements like plants, photographs and stationary indicating the “ownership” of a desk and a personal territory. (Zeisel J. 2006). The choice of seating evolves into a pattern, reflecting hierarchy and social preferences (Petendra B. 2013, Augustin, S., 2009)
That kind of behaviour takes place despite rules not to do so. The need to negotiate territory can lead to a competition for the best desks and as a consequence to hidden conflicts (Gerhardt A, 2014).
A non-territorial workplace layout requires a clean desk policy asking to leave a neutral workspace at the end of a working day or after a certain time. Lego calls it a “No camping” policy. A clean desk is a non-personal, more or less neutral and lean work environment.
It is at the same time recognised that people today love to express their personality in social media, in their homes and with livestyle choices.
The same is true for the workspace. Personal things on the desk display the owners’ personality. (Amstutz S., Schwehr P., 2015, Augustin, S., 2009). Most people prefer to “improve” their work environment and dislike a clean desk policy.
Personal elements can help to reduce stress and increase productivity and creativity substantially as reported by Walden R., (2008), Augustin, S., (2009), Gerhardt A, (2014) and Kohlert C. and Cooper S. (2017). It seems also that items can work as a trigger for memory if we looked at them while we learned something. Which means nothing less than knowledge can be partly linked to a place (Augustin, S., 2009).
The display of personal elements is a degree of control, which is desired by most people. Even a voluntary clean desk is a personal statement. Being in control makes workers feel more productive, comfortable and healthy, this is why the possibility to alter light, climate and working-position is beneficial. It is sometimes claimed that the non- territorial office or the activity-based office is offering such a possibility by choosing a suitable place. It is indeed positive to provide breakout areas for greater choice, but to change a given space or to choose a given space is not the same, as the following study by Knight C., Haslam, S.A., in 2010 illustrates.
Participants of the experiment worked on different tasks in four different office environments. The first one was a lean office with a neutral design. At the next one the environment was enhanced with colours, pictures, plants, etc. Here the increase in productivity was 17 % when compared with the lean office. In the next round people could move the interior design elements like they wanted. The difference to the lean office was now a 32 % increase in productivity. At last people completed tasks in a room where their own arrangement of things was changed without their consent. Surprisingly the productivity was back to the level of the lean environment. That shows how important it is to give people a feeling that they are in control. (Flade A., 2008 and Augustin, S., 2009).

Being able to alter and control a part of the office is also a symbolic way of showing one is part of the organization. People feel more rooted and connected to a company with a personal place of their own. That is even true for employees working mostly away from the office (Gerhardt A, 2014).

An increased or maintained sense of belonging is also important with regard to the growing gig economy and work in temporary project teams. A defined territory supports the groups' identity and therefore their interaction.

The negative aspects of non-territorial offices are often compensated with the increased use of home offices (Marmot A., 2008). That can be an attractive part in an effort to balance work and everyday life. But used in excess it can also add to the challenges regarding internal communication, team building and leadership. Working away from the office and an established social group demands a higher degree in self-management. Not always do all employees perceive this as positive. The potential lack of feedback and an increased uncertainty about one´s performance can lead to stress and burn out. Especially young and more inexperienced employees do appreciate the contact with older colleagues in order to learn from them.

It can be stated that an office still needs to be a socially integrating place and mental base, where one presents themself and its work as part of a larger organization. (Petendra B. 2013, von Erdély A., 2018)

2. PALAEOLITHIC PROGRAM

Non-territorial workplace concepts with clean desk policies do not produce the desired result in changed behaviour. We have seen that people want to be part of a stable, trustworthy group, where they can express their personality and have control over their surroundings. Only then is it possible to build up knowledge, increase wellbeing, joy of work and loyalty.
The reason for a rather difficult or impossible implementation of a non-territorial workplace lies in its intellectual character. We believe that it is enough to understand and agree to a behaviour change in order to implement it. Well, as with all "bad" habits there is a deeper reason that it is hard to change. It would be wrong to blame someone as stubborn or conservative only because it seems difficult to adapt to a new workplace idea.

Humans read and interpret space constantly like a language of symbols. An office is a mental landscape and topography of emotions. That takes place mostly unconsciously and is non-intellectual.

Our behaviour, defending of territory, environmental control, need to be part of a group, and so on are all part of a very old way to act and interact with our environment in order to survive.
Humans are perfectly adapted to the environment. But that environment is not the one we live in today!
For about 400 000 years we lived in a context quite different to our present conditions. It is that gap between the habitat we are equipped for and our current environment that is the cause for an array of today's challenges.
It is therefore worth taking a closer look at our connection to the Palaeolithic age.
Humans have got a remarkable ability to adapt to environmental changes. We can change our behaviour, our brain is adaptable and even our genes can change in a process called

epigenetics. One could therefore anticipate that we can even adapt to our contemporary environment. But our flexibility has limits even if we can react flexibly to different natural conditions. The changes from our original habitat to modern life are so fundamental and numerous that an adaptation would take a very long time, if at all possible. (Glöckl J., Breithecker D., Gabler S., 2014)

Only by accepting that we are still equipped for a life in nature and not for our modern world, can we begin to understand how we can make improvements. This is true for all aspects of life, for the design of our physical surroundings, for movement and ergonomics, sleep and the way we eat. (Glöckl J., Breithecker D., Gabler S., 2014, Gundry S. R. 2017)

3. INFLUENCE

In the last couple of years brain research and environmental psychology has helped enormously to understand better how we interact with our surroundings.

That will be demonstrated with the help of a few examples. The intention is to describe an overview of different aspects rather than a detailed examination of every single effect.

3.1. ACOUSTICS

Noise is the number one complaint in the evaluation of offices (Krupper D., 2011). It has negative effects on the heart, well-being and cognitive performance (Flade A., 2008). High noise levels (55 – 65 dB) lead to stress and a lower satisfaction with work and the workspace, sometimes even unconsciously. Speech is one of the most distracting noises for us, because it is hard to ignore (Augustin, S., 2009).

3.2 LIGHT

The colour of light and intensity can influence people's behaviour and performance on certain tasks like problem solving, risk taking, short and long-term memory, collaboration and creativity.
Sunlight is positive for happiness and well-being and can improve performance. Artificial light simulating daylight can even contribute to overall health. Experiencing different light temperatures at the same time seems more enjoyable then a uniform one (Augustin, S., 2009).

3.3 SYMBOLS AND TRIGGERS

It was already mentioned that items can be linked to memory and can help to recall knowledge. But things and spatial setting can even determine how we behave (Augustin, S., 2009). The most well known example is of course the "Broken Window" effect, which is based on a signal that a certain kind of behaviour is normal.

3.4 COLOUR

Even if the perception of colour is partly dependent on cultural background, it seems true that colour has a profound impact on our senses and emotions, including performance, health, perception of space and even time (Mahnke F. H. 1996).
There are examples of prison cells in Switzerland painted in so-called “cool down pink” in order to calm down aggressive inmates (Oehlke M., 2013).

3.5 BIOPHILIC DESIGN

Indoor plants do have a surprisingly strong effect on us. They can reduce stress to an extent that performance suffers. Used in the right amount can plants nevertheless enhance performance, creativity and well-being. (Kohlert C. and Cooper S., 2017). Views of nature are however an even stronger stimulus than plants indoors (Flade A., 2008 and Augustin, S., 2009). Being in a natural setting like a forest shows even stronger results, as the research regarding Shinrin-Yoku proves. Spending time in a forest can be seen as a way to relieve mental and physical problems (Selhub E., Logan A. C. 2012). Understanding the influence of nature can inform interior settings.
Biophilic design is a way of connecting us with nature. Natural elements like plants, views of nature, water, animals, natural materials and pattern represent a powerful stimulus which increases well-being and as a result performance and health (Kellert, S. R., Heerwagen, J. H., Mador, M. L. 2008 and Nieuwenhuis. M, Knight C., Postmes, T., Haslam S.A. 2014).
Extensive research has been conducted concerning the effects of natural settings in the form of so-called forest bathing (Shinrin-yoku). Hereby were people exposed to a forest environment over a certain time. After only 15 minutes of viewing a forest scene a significant reduction in pulse rate could be observed relative to the view of an urban setting. That was true for people with a less stressful lifestyle (type B) but holds certainly even true for everybody when exposed to nature over a longer period (Song C., Ikei H., Lee J., Park B., Kagawa T., Miyazaki Y. 2013).

3.6 ERGONOMICS

In contrast to conventional advice regarding ergonomics, the latest research shows a different approach (Glöckl J., Breithecker D., 2014 and Gerhardt A., 2014). Instead of locking the body in a certain position, is it better to change position and posture after 20 minutes. A flexible and varied spectrum of different working positions ensures micro-movements and the usage of all muscles, joints and bones. That leads to a better blood circulation, which is vital for a sufficient level of oxygen in the brain and works as prevention against tiredness and lack of concentration.
Even moderate movement can reduce stress. Stress in a natural environment is the brain´s reaction to dangers, a stimulation to flight or fight, a physical movement. In today´s stress situations a physical reaction is usually inappropriate, which leads to a dilemma. Without the natural physical reflex it is difficult to lower the stress related adrenalin level in the body. That can in the long-term cause high blood pressure and arteriosclerosis. A lack of

movement is even related to a weak vestibular system and a poor sense of balance. The most serious effect is however the reduced blood circulation and as a result the restrained function of organs. The long term effect is known as one of the most important causes of ”Sedentary death syndrome” a term for health problems linked to a modern lifestyle. (Glöckl J., Breithecker D., 2014). There is even evidence linking physical inactivity to mental problems (Ekblom Bak, E. 2014). Movement on the other hand is supporting brain activity. This is why waking-meetings are sometimes a good idea (Augustin, S., 2009).

Training after work is positive but can not make harm by too much sitting undone. The benefits of sport have been understood for a long time. (Hansen A., 2016). The importance of avoiding a static body position is still a novelty.

This is only a very limited list of effects spatial aspects have on us. But it becomes clear that all reactions, our behaviour, can be explained with our former life in nature. It is important to understand that these reactions are not a product of rational thinking but rather of old instincts, a very efficient way to behave in a natural environment when survival is a priority. Back then we were living in nature and were even a part of nature. Just 10 000 years ago we started a journey towards today´s civilization. (Hansen A., 2016). If we want to come to terms with the endless list of health problems we are facing today, we need to consider more and better contact with our original habitat.

4. EFFECTS

Considering and integrating these aspects into architecture leads to substantial effects. They are particularly strong because they are mostly unconscious. Neuro-marketing is already using some effects by facilitating priming and framing. Even the concept of nudging is touching on these processes.

There are various aspects relevant to workplace design:

A large amount of research shows all kinds of improvements if one or more aspects of the above list are done right.

Table 1 Different interventions and there effects

Effect	**Margin**	**Means**	**Author**
Cognitive performance	Increased by 13 – 101%	Plants	Glöckl J., Breithecker D., Gabler S., 2014
Information usage and strategy	Improves by 171 – 299%	With plants	Allen J. G., MacNaughton P., Satish U., Santanam S., Vallarino J., and Spengler J. D. 2016
Information search	Degreased by 6,5 and 10, 6 %	Background speech	Jahncke H. 2012

Memory	Decreased by 8,7%	Background speech	Jahncke H. 2012
Memory	Decreased by 30%	Background noise	Jones D., Hughes R., Marsh J., Macken W. 2008
Productivity	Increase by 15 %	Plants	Knight C., Haslam A., Nieuwenhuis M., Freeman K. 2014
Productivity	Productivity by 5 - 50%.	Introduction of plants	Glöckl J, Breithecker D., Gabler S., 2014
Productivity	Increased	Pink noise	Fitzgerald C. J. and Danner K. M. 2012
Productivity	Increased by 32 %	Plants	Knight C., Haslam S.A., 2010
Productivity	32 and 38% increase	Control over the layout of their workspace	Knight C. and Haslam S. A., 2010 and Knight C. 2013
Productivity	20 % higher	Improvements regarding air, noise and light	Krupper, D. 2013
Crisis response	Improves by 97 – 131%	Plants	Allen J. G., MacNaughton P., Satish U., Santanam S., Vallarino J., and Spengler J. D. 2016
Work performance	Substantial influence	Attractive furniture and plants	El-Zeiny R. 2011
Concentration	Improvement	Variable thermal climate and airflow	Hartig et al 2003
Concentration	Improvement	Presents of water	Hartig et al 2003
Creativity	Increased by 81 - 100 %	Walking	Oppezzo M., Schwartz D. 2014
Creativity	Improvement	Natural materials	Lichtenfeld et al 2012
Wellbeing	Increased by 15 - 47 %	Plants	Glöckl J., Breithecker D., Gabler S. 2014
Wellbeing	Increased by 13 %	Plants	Kohlert C. And Cooper S. 2017
Mood and sense of well-being	Increased	5 min outdoor exercise	Barton J., Pretty J. 2010
Happiness	Can be caused	Relatedness to nature	Zelenski J., Nisbet E. 2014
Health	Improvements	Increased ventilation rate	Seppänen O., Fisk W.,Mendell M., 1999
Stress	Reduction	Visual contact to nature	Brown D., Barton J., Gladwell V. 2013

Stress	37 % faster reduction	Nature sounds	Browning W., Ryan C., Clancy J. 2014
Stress	Reduction	Contact with animals	Browning W., Ryan C., Clancy J. 2014
Stress	Reduced by 10 – 60%	Plants	Daly J., Burchett M., Torpy F. 2010
Pulse rate	Reduced	15 min of forest view	Song C., Ikei H., Lee J., Park B., Kagawa T., Miyazaki Y. 2013
Comfortable, calmer, more refreshed feelings	Significantly more	Walk in nature	Park B., Tsunetsugu Y., Kasetani T., Morikawa T., Kagawa T., Miyazaki Y. 2009
Pulse rate	Reduced	Walk in nature	Park B., Tsunetsugu Y., Kasetani T., Morikawa T., Kagawa T., Miyazaki Y. 2009
Sympathetic nervous activity	Tend to be lower	Walk in nature	Park B., Tsunetsugu Y., Kasetani T., Morikawa T., Kagawa T., Miyazaki Y. 2009
Autonomic nervous activity	More relaxed	Walk in nature	Park B., Tsunetsugu Y., Kasetani T., Morikawa T., Kagawa T., Miyazaki Y. 2009
Healing process and immune function	Positive effect	Smell of essential oils from trees	Browning W., Ryan C., Clancy J. 2014
Visual comfort	Improvement	Dynamic light	Elyezadi I. 2012
Visual comfort	Relaxation for the eyes	Non-rhythmic visual experience	Browning W., Ryan C., Clancy J. 2014

The list of examples could easily be continued with a few hundred results.
It is not the intention to discuss certain findings, even if they are indeed very important for the implementation in architectural projects. More important is to understand the underlying consequences and to see the whole picture. It is necessary to state that all findings describing a beneficial condition were part of a normal human environment a few thousand years ago. The only parameter not directly linked to these times may be cultural influences. They do alter preferences and behaviour but not the most basic pattern of reaction. Table 1 illustrates and strengthens the view expressed in part 1 and 2: an evolutionary perspective towards our cultural environment is the most coherent explanation to date and is able to interconnect observations of all kinds.

Aspects not sufficiently covered by today´s research efforts is a more cross-disciplinary approach to answer the question if certain effects are strengthening each other or if the reaction is stabilized at an optimum even with some parameters not fully positive. A second field of possible future research is the established negative mental effect of an urban environment. It would be most interesting to learn if that is true even for more traditional architecture, which is culturally perceived to be more positive. That would touch on the issue if the negative response of the brain towards architecture is of principle nature or if it could also be a matter of architectural style.
Most important however is probably a broader fact-base regarding the commercial benefits of the already existing conclusions. It is for individuals and for society most desirable to implement the documented kind of research as much as possible. The best way to communicate the benefits within a business context is the financial argument. It is therefore necessary to explore the pre- and post occupancy evaluation with this kind of project much more than to date.

5. CONCLUSIONS

To understand that space influences us more than we expect is not new. Already 30 years ago (Zeisel J. 2006) it was reported that patients in hospitals reconvert faster in rooms with certain features, above all a view to nature. They needed less medication and had lower pulse than patients in similar rooms but without these features. This knowledge is therefore more and more implemented in modern hospital-projects. Similar effects were noted regarding the learning results in schools with consideration to light and biophilic design.
It is however not common knowledge yet that space and architecture influences us to the degree it does. An architect or interior designer is still deciding with a rather artistic attitude only taking in account form, function and cost. How space design influences our brain, health and behaviour and therefore our well-being and productivity is for many widely unknown.
Artistic abilities are of course still needed, but only in combination with a human-centric approach is it possible to facilitate architecture in the right manner. Only then can architecture play a new role as a tool to improve people´s lives fundamentally.
This is of practical interest in respect of stress related health problems and mental issues. But even management and business consultancy can make use of this new instrument. Improving business performance through well-being is a win-win situation and a huge opportunity for society as a whole. (Glöckl J., Breithecker D., Gabler S., 2014). The potential for financial gain with this approach is not marginal. There are several studies pointing towards savings on a scale of half the office rent in CPD or 2,5 % of staff salary every year (Walden R., 2008).

We call this new approach “evidence based architecture”.
It is based on a new and deeper understanding who we are and which needs we have got. It is therefore not just a new trend or fashion but the beginning of a new way to do architecture.
If architecture can be described as a symbolic language, than we are just about to discover the grammar to the words we are using (Lu X., Clements-Croome D., Viljanen M. 2012)

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