A Stress Free Workplace
- Spatially planned office space to diminish environmental stress

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Abstract

The main objective of this thesis was to understand the environmental variables that affect humans psychological states when it comes to stress. More specifically, the environmental variables at the company Maintpartner AB’s new Swedish headquarters office in Årsta, Stockholm, a company concentrated on customized industrial maintenance and operation service.

In my thesis I found evidence that open-plan solutions would be a stressor due to increase disturbance from coworkers. Open-plan offices could also be perceived as a stressor because of the limitation in personal control. Through implementing nature and/or integrating it via visual escape the space could be perceived as more attractive and less crowded.

Maintpartner AB's administrative personnel has highly individual work tasks and therefore a need for customized workplaces.

This resulted in a design concept with separated office rooms, individually designed to meet the staff’s individual need. Some areas are designed to work as meeting areas for work or social related encounters.

Key words: Environment stress, spatial design, office
Förord

Huvudsyftet med denna uppsats var att förstå de rumsliga faktorerna som påverkar människors psykologiska tillstånd när det kommer till stress. Mer specifikt, de rumsliga faktorerna på det svenska huvudkontoret hos företaget Maintpartner AB. Ett bolag vars verksamhet är fokuserad på skräddarsytt industriellt underhåll och driftjänster.

I min uppsats fann jag belägg för att kontorslandskap kan vara en stressfaktor på grund av ökade störningsmoment från arbetskamrater. Kontorslandskap kan också uppfattas som ett stressmoment på grund av begränsningen av kontroll över det personliga utrymmet. Genom att sammanfläta rum med naturen eller integrera naturliga element uppfattas rum mer attraktiva och mer rymliga.

Maintpartner AB: s administrativa personal har mycket individuella arbetsuppgifter och har därför ett behov av anpassade arbetsplatser.

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Introduction

The single most common reason of sick leave in Sweden is stress,\textsuperscript{1,2} on top of that, it is the most common reason of work-related disorder(s).\textsuperscript{3} Approximately 870 000 workers have experienced work related disorders and nine out of ten people have reported either work ergonomics, stress or psychosocial relations as the cause of the disorder.\textsuperscript{4}

During 2012 approximately 9000 people were absent from their work due to stress. Which costs the society almost three billion Swedish crowns every year.\textsuperscript{5}

I believe that the greater insight we gain regarding human behavior and biology we will realize how we can minimize the work related disorders and in the long term decrease the cost on society. It seems to me like the research between recovery rates and hospitals spatial environment started a long time ago, but it is only now we start to apply the knowledge. I think that we should also start to see the impact on the space where the majority of the population spend a third part of their days, the office. By doing this thesis I will be one step closer on applying the knowledge.

Purpose

The purpose of this thesis is to understand how to create a spatial environmental experience, optimized for prevention of work related disorder directly connected with stress, created by the physical environment. Further on my aim is to apply the knowledge when planning the new office space at the company Maintpartner AB. When we design places there is more to it than esthetics. I think that we should always look at the function and its user as well as understand the relationship between them. When we design a office space we should consider the effect that the environment has.

\textsuperscript{1} P4 Kollar. Stressten kostar samhället miljarder. Nyheter P4 Jämtland, 15 February 2012, viewed 17 April2013.
\textsuperscript{2} Persson Janerik. Arbetsorsakade besvär, Arbetsmiljöstatetstik Statistiska Centralbyrån/arbetsmiljöverket. Online publication, sep 2010, viewed 19 April 2013
\textsuperscript{3} Persson Janerik. Arbetsorsakade besvär, Arbetsmiljöstatetstik Statistiska Centralbyrån/arbetsmiljöverket. p. 30
\textsuperscript{4} ibid., Abstract
\textsuperscript{5} P4 Kollar. Stressten kostar samhället miljarder.
Questions

What indoor environmental and interior design variables, in a desk office environment, could create or enhance stress associated with ambient environmental conditions? And how could this be applied on the company, Maintpartner AB's, new office?

That mean that I will study how the layout in the spatial environment effect physical stress. I will also look into, what perceived spatial environment could decrease stress. As well as, what influences has natural elements on the worker when it comes to stress reduction. But I will also examine how the group dynamic is being perceived by the staff at Maintpartner AB.

Partners

This thesis will be done in coproduction with my fellow student Amanda Löwenberg's final thesis. We will both have the goal of applying researched knowledge on Maintpartner AB's new office space in Stockholm, Årsta. She will on the other hand research about creativity and her goal is to create a creative environment rather than stress free, as my goal is.

Maintpartner AB

Maintpartner AB delivers, as the name implies, industrial maintenance and operation service. They describe their service as a customized industrial service solution that always strives for the most efficient and developed ways.

It is a company that helps its customers to focus on their core business by maintaining their production processes. Their three focus service areas are customer service, reliability and change execution.6

Maintpartner AB is a Nordic company with business in Finland, Sweden and Poland. With the biggest market in Finland and the newest in Poland, 2011, Maintpartner AB is a company with approximately 1650 employees and they have a annual net sale of 160M Euros.7

Their main business in Sweden is today located in Karlskoga. Their line of business in Sweden is the public sector with for example the main responsibility for bridges in Stockholms county. 8

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6 Maintpartner group, Maintpartner Sweden. 2012, viewed 20 May 2013, Services and solutions
7 Maintpartner group, Maintpartner Sweden. About us
8 ibid., Organization
Limitation

I will not study stress associated with psychological demands, such as time pressure or bulling. I will neither study stress created by physical conditions caused by work related physical situations, such as ergonomics or other musculoskeletal disorders. The possible stressors studied, will have roots from ambient environmental conditions. The environmental conditions studied to decreased stress will be interior design variables and indoor environment variables.

With interior design variables I will include layout, function, spatial form and shape. I will not discuss colors and its impact. I believe that it is vital to have knowledge about potential effects given by colors. But the magnitude of the issue as well as the insecurity of reliability in the field has made me exclude it. Neither will I include variables such as material or equipment (furniture's or technical solutions) due to the limited possible range of the thesis. This means that furnished solution will only be shown to demonstrate function, therefore should not attention be put on choice of selected furniture.

In the field of indoor environment variables I will discuss the impact of some outdoor associated variable; plants, natural light and noise. I will not consider artificial light nor will I talk about ambient temperature and air quality due to the limited width of the thesis.

I will not examine the long term effect of stress in these situations nor will I as a rule explain why it is a stressor, rather I will point out the possible stressors that research has found.

I will not conduct a cross-sectional thesis which means that I will not include differences in culture, ethnicity, gender, sexual orientation, or social standards due to the limited possible dimension of the thesis.

Target group

The main target group will be Maintpartner AB and the twelve staff members that will be located at the new office. The target group will also consist of people at times working at the office in Årsta e.g. consultants or people normally located at Maintpartner AB's other offices, estimated being no more than two at the same time. Customers and potential customers to Maintpartner AB will also be included in the target group. Unavoidably the target group will then include first time visitors as well as fulltime workers.
Method

Literature

The literature research has primarily been written in a descriptive search way. Which means that I have examined and explained the experience of stress linked with the spatial environment. I have also, to some extent, composed an explanatory thesis since I have studied and concluded how the spatial environment ought to be in a stress reductive way.

The purpose of this research is to understand a generalization about how people experience their environment when it comes to stress.

Procedure

To find my search words, I started with literature in the area of environmental psychology toward design. Thereafter I have been using the webpage PsychINFO to search for articles. My criteria has been peer reviewed articles published after 1960. They had to have a clear connection with office spaces but did not necessarily have to contain the word stress, but state of minds associated with stress, such as anxious, anxiety, and tension.

Survey

The Survey was conducted with influence from QPSNordic questionnaire which is a conducted by the Nordic ministry. It is created to examine psychological and sociological aspects of peoples work-environment. The survey could be seen as a quantitative research treated in a qualitative matter. The Survey was written together with Amanda Löwenberg.

The ambition of the survey was to understand the social environment and demands at the company. As well as to understand the bigger crowds needs namely all affected employed at Maintpartner AB today.

Procedure

The survey was done in Google Drive and was sent via email. The target group were people who work full time or part time at Maintpartner AB’s office in Stockholm, Årsta. Fourteen people received the survey. Eleven people answered.

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11 QPSNordic General Nordic Questionnaire for Psychological and Social Factors at Work, Nordiska ministerrådet, Publication nr. TemaNord 2000:603, Published 1 January 2000, viewed 17 April 2013
the survey, that means that three people did not answer the survey. One person has reported technical issues and additionally one person will quit at Maintpartner AB and did therefore not answer.

The results was then put in block charts so that information from different questions could be compared.

**Interview via photo diary**

The interviews were made via a photo diary and were conducted together with Amanda Löwenberg. It is a qualitative research method and can be seen as a sampling, the process where you study a smaller group in order to apply it on a bigger group. \(^\text{12}\)

By interviewing via a photo diary the goal was to understand how people worked today. What kind of problems did they have and what previous experiences did they possess.

**Procedure**

Six people were asked to make a documentation over their work day during a week. The group consisted of people both fulltime and part time workers at the office in Årsta, Stockholm. The participants that were part time working at the office in Stockholm worked the other hours in Karlskoga, Sweden but at the same company. Since everyone had a phone with a camera provided by the company, we did not supply them with one.

After the week of individual documentation we carried out a unstructured interview. That means that we did not predetermine questions, rather we let the participants describe what the pictures represented and asked some follow-up questions where we felt that more information were needed.

One person excluded himself due to time limitations and one person misunderstand the assignment and did not carry out any photo diary.

**Spatial Observation**

To comprehend the subjective spatial experience at Maintpartner AB's new office space as well as how I want it to be perceived I conducted observations. One method is a graphic room analysis, explained and constructed by Arne Branzell influenced by Kevin Lynch. \(^\text{13}\) This method is conducted by experiencing

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the room and translating it into signs. This helps to explain the subjective perception of a space both as a base for discussions as well as reflection.

Procedure

The signs I used during this observations did not include any movement patterns since the space was now empty. Rather, the signs that were used in my observation are influenced by Arne Branzell but modified.

The circle explain the perceived space divisions or zones. It also communicate how the space tend to act.

The pink lines symbolizes the movement that the room has and the thicker the line the more defined is the limit of the zone.

The blue lines symbolizes a perception of openness. The closer together and longer lines the more intense the openness is perceived.

The purple line is contrary to the blue. It symbolizes closeness or an edge. The more intense line reflect a more intense feeling of closeness.

The green V symbolizes the starting point and to what direction my visual attention was directed.

A rainy day at 10:30 am the 15th of april 2013 I carried out the observations. The observation was made from two different point at the new office space. At each observation point two different layouts were completed. The first was the original layout, how the place is built right now. The second layout was how I wanted the space to be perceived in the completed office space.
Sketching

The method of sketching was in this case conceptualizing oral ideas into simple freehand sketches over the layout. They have been done on a low technical level. During the processes of collecting data from both literature and empirical research, sitemap sketches have been done continuously. Every sketch or idea has been marked with the origin of the idea and date.

The purpose of visualizing ideas is to store the ideas, both so it could be developed in a later stage of the design process as well as developed during the sketching.

Procedure

Fifteen different sketches were made between the period of 15-03-2013 and 1-05-2013.

Visualization

After the first freehand sketches were made and all data collection was completed, the next level was applied. By using the software program Sketchup, the free version provided by Google, some of the ideas could be tested with real measurements and with furniture. Eventually, leading to my final design proposal and finishing visualization of the plan.

The purpose of this method was to test the ideas and to be able to make selection between the different ideas. And finally, to come up with one final concept.

Procedure

Ten different Sketchup file variants were made between the period of 03-05-2013 until 15-05-2013. Some ideas were direct realizations of sketched ideas and some were a development from previous ideas. The selection was then made by comparing the guidelines, from the theoretical framework and the empirical findings, with what the design concept ideas fulfilled.
Theoretical framework

Since the dawn of time the environment has affected us. It has influenced our behaviors and actions, e.g., building a bridge over water to come across. As well as it has influenced the evolution of our entire species.\(^\text{14}\) We have changed the environment around us from living in caves to skyscrapers, but has this also changed us?

Physically measurable conditions such as temperature or air quality has been seen linked with producing physical outcomes, such as lower job performance.\(^\text{15}\) But what about the subjective experience and mainly the feeling of stress?

I have found evidence, and studies have shown, that stress may be induced due to the environment.\(^\text{16}\) The environment exists of different variables supplementary and somewhat dependent among themselves. One possible way of viewing the environment is by separating it into indoor environment variables and interior design variables.\(^\text{17}\) The indoor environment variables aim to scope attributes such as noise, lighting, ambient temperature, and air quality. While interior design focuses on the use of space, furniture’s, fixture, and equipment.

The human state stress also consist of this complexity, and it is highly relative. So to understand stress we have to understand humans.

Perspective

I will use the research found in this chapter and combined with information from my empirical research as well as my professional knowledge when I create Maintpratners new office space.

I will examine the environment from the same point of view as a environmental psychology advocates. Environmental psychology could be defined as the study of symbiotic relationship between humans and their environment. They use a collected view of cognitive, humanistic, learning or behavioral, neurobiological, and socio-cultural perspective.\(^\text{18}\) That means that the behavior linked with the environment could be explained in several different perspective where none is more correct than the other.

\(^{14}\) Kopec Dak, *Environmental psychology for design*, New York: Fairchild publications, 2006 p.3
\(^{16}\) Ibid, pp.151-153
\(^{17}\) Kopec Dak, op. cit., p.4
Psychological states

The fundamental psychological states that integrate humans with the environment are summed up by Kopec as personal control, adaption, overload, affect, and arousal.\textsuperscript{19}

\textit{Personal control} is the ability to have a subjective feeling of control over a situation or environment. In places like prison humans tend to have the least feeling of personal control. While places like home or their personal space in their home is where we feel most control. \textsuperscript{20}

\textit{Adaption} aim to explain the capacity of adjustment, how easily we can get use to stimuli in our environment to the extent of not perceiving or noticing it anymore. For example when humans are exposed to an unpleasant smell, adaption to the smell means that we will not notice it after a while. But it could also mean a certain desire for stimuli.\textsuperscript{21} For example the adaption to smoking or sugar consumption which gives so called addictions and for more, the desire for more stimuli.

\textit{Overload} on the other hand is the notion that humans has a limitation in possible intake of stimuli, when exposed to levels over limitation we experience overload.\textsuperscript{22} This mean that we become incapable of processing any stimuli and could result in a fight or flight reaction or withdrawal.\textsuperscript{23}

\textit{Affect} intend to explain the emotional reaction to the environment. Where environmental conditions can be associated with memory or sensation preferences,\textsuperscript{24} e.g. the smell of freshly made cinnamon buns might be associated with your childhood or the sudden view of a wallpaper bringing you back to the summer cabin.

\textit{Arousal} could be seen as the description of a conscious psychological state.\textsuperscript{25} These states could be "… described as a being somewhere along a continuum between sleep and excitement".\textsuperscript{26} Arousal levels can influence the possibility to

\begin{thebibliography}{99}
\bibitem{19} Kopec Dak, op. cit., p.26
\bibitem{20} ibid., p.22
\bibitem{21} ibid, p. 24
\bibitem{23} Kopec Dak, op.cit., p.26
\bibitem{24} Ibid., p.26
\end{thebibliography}
store memories. The higher arousal, either positive or negative, increases the memory recall.\textsuperscript{27}

These states can be described as a psychological process that has a behavioral outcome. If a designer understands these physiological processes he can design an improved environment\textsuperscript{28}, a human oriented environment.

**Perception**

Humans understand their environment, we interpret a meaning of the space. We perceive our surroundings somewhat different from human beings, it is dependent on human qualities as beliefs, preferences, experiences, and personality.\textsuperscript{29} That means that factors that could be a stressor for one person might be normal or even preferable for someone else.\textsuperscript{30} When we talk about psychological environmental experiences such as overload or arousal the perception comes down to the concept personalities. Personalities determine how stimuli influenced us. Personal types could be explained as introvert, extrovert, sensory, intuitive, thinker, feeler, judge, or perceiver. While personalities consist of a complex combination of personal types.\textsuperscript{31} Workplaces consist of complex combinations of personal types, and research shows that satisfaction with an environment is linked with satisfaction with surrounded people.\textsuperscript{32}

**Personal space**

Arne Branzell (1995) describes that we can see the experience of personal space as a sensitive personal spherical outer power field, or as a space bubble. It could also be described as a continues of the fetal membrane we were protected by in the womb.\textsuperscript{33} The bubble has several different characteristics and it is not only self oriented. Space, physical rooms, objects, and all humans have their own bubble but subjectively experienced and created by the observer. How the bubble manifests is highly personal, some people want to include others in their own bubble while others might want to share a bubble.\textsuperscript{34}

\textsuperscript{27} Gazzaniga, op. cit., pp.376-377
\textsuperscript{28} Kopec Dak op. cit., p. 26
\textsuperscript{29} ibid., p.7
\textsuperscript{30} Mahub and Zimring, A review of the empirical literature on the relationship between indoor environment and stress in health care and office settings. p.152
\textsuperscript{31} Kopec Dak op.cit., p. 46
\textsuperscript{34} Branzell, Arne, *Något om ...: liten skissbok om det upplevda rummet*, pp 30-31
The main idea goes back to Robert Sommer that in 1969 introduced the term personal space and described it as "An area with an invisible boundary surrounding the person´s body into which intruders may not come". Sommer's studies show that the invisible boundary is different dependent on the position of a possible intruder, both when it comes to angles as well as to distance. In a competitive environment people tended to sit face-to-face (direct orientation) but far apart, compared to cooperative environment where people where positioned side-by-side (indirect orientation) and closer. Studies also suggest that the personal space could be transmitted to persons belongings.

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37 ibid., p.26
Control

It is the perceived control that can trigger personal space issues into a stress factor. When the personal space is intruded or the tension changes it could lead to discomfort and/or personal feeling of infringement. It could occur when the preferable distance is not the same and then be unintentional, for example a friend being too close. But it could also occur when it is intentionally broken such as in a robbery or assault. It is shown that unwanted interaction, intrusion of the personal bubble, is linked with increased anxiety.

Personal space qualities

It is not only a static subjective feeling that determine our need for personal space. Research also show that we tend to need less space bubbles in dimmed light setting. Further on, the need for personal space in corners seems to be greater than when centered in a room. On the other hand, research show that the need for personal space grows as we are inside, compared to outside. It is shown that it is also the vertical limitation that limit our space bubble preference. This could be interpreted as a correlation between the perceived space and the physical, the less perceived space the greater physical need for space.

40 Branzell, Arne, Något om ...: liten skissbok om det upplevda rummet, op. cit., p.28
41 Middlemist, op. cit., p.545
45 Kopec Dak, op. cit., p.68
5. Less perceived space due to vertical limitation result in greater need of personal space

One theory separates the personal distance into four different zones as seen in the tablet in picture 6 below. It is based on Halls personal space theory and examine the general comfortable distance dependent on relationship. Research show that the personal space is not a circular zone. Rather we claim a greater distance in front of us than towards the sides and back.

<table>
<thead>
<tr>
<th>Personal space zone</th>
<th>Approximate distance</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intimate</td>
<td>0-45cm (0-18”)</td>
<td>Used by people with a strong bond e.g Sexual intercourse, nursing</td>
</tr>
<tr>
<td>Personal</td>
<td>45cm-1.2m (18”-4’)</td>
<td>Kept by close social contacts, e.g. conversation with a friend</td>
</tr>
<tr>
<td>Social</td>
<td>1.2m-3.6m (4’-12’)</td>
<td>Distance between acquaintance e.g during businesses meetings</td>
</tr>
<tr>
<td>Public</td>
<td>3.6m-7.6m (12’-25’)</td>
<td>Used by people only connected with one another through space</td>
</tr>
</tbody>
</table>

6. Halls personal space theory

Crowded

The feeling of crowdedness is not only a question of density in people.\textsuperscript{47} It is a subjective feeling of physically being constrained or that the personal space is interfered.\textsuperscript{48} Since crowdedness is a psychological factor it is not necessarily a correlation between the amount of people, social density,\textsuperscript{49} and therefore not normally a stressor in places where we can expect high social density. Crowding is proved to result in stress when there is low personal control.\textsuperscript{50}

In association with personal space, which we need less in dimmed light, the feeling of crowdedness manifests somewhat different. We tend to perceive a space less captivated when it is bright and therefore less crowded.\textsuperscript{51} Research also show that it is a correlation between the floor-level of a room and perceived spaciousness. The higher up a room is located the more spacious it feels.\textsuperscript{52}

Other researches show that the layout of the room could also increase the possibility of feeling crowded. Visual escapes, such as doors and windows,\textsuperscript{53} and visual distractions,\textsuperscript{54} such as art, potteries or other decor, also help the perceiver to not feel crowded. Whether or not there are curved or defined corners also plays a roll. For example research show that curved walls could trigger crowdedness more likely than corners.\textsuperscript{55}

Prospect-refuge theory

In \textit{The Experience of Landscape}, Appleton explain the preference of an environment that makes a clear prospect (ability to see far) as well as a refuge (a place where we can feel safe).\textsuperscript{56,57} This is originally a theory based on landscape design and has its roots in the early human ways of living where shelter in a closed area (refuge) was as important as the possibility to see the danger or possible food (prospect).\textsuperscript{58}

\textsuperscript{48} Bell, Paul A. (red.), \textit{Environmental psychology}, 5. ed., Harcourt College, Fort Worth, Tex., 2001 via Kopec Dak, \textit{Environmental psychology for design} op. cit., p.71
\textsuperscript{49} Kopec Dak op. cit., p.72
\textsuperscript{51} Baum Andrew and Davis Glenn E. Spatial and social aspects of crowding perception. \textit{Environment and Behavior}, Vol. 8 Issue. 4, 1976. p.536
\textsuperscript{52} Naz, Kaya and Feyzan, Erkip op. cit., p.47
\textsuperscript{54} Baum Andrew and Davis Glenn E. op. cit., p.541
When the theory is translated into an interior architectural application, prospect is translated into spacious, large and light, rooms while refuge into cramped, dark and small, rooms.\(^{59}\) One research suggest that it is more comfortable to view the room associated with refuge from a prospect room, e.g. viewing a small room from a large.\(^{60}\) Appleton, on the other hand, claim that it is the relationship between the aspects prospect and refuge, the feeling to be able to see without being seen, that determine our feeling toward a space.\(^{61}\)

**Natural elements effect**

When people need restoration in both physical and psychological ways we tend to turn to nature.\(^{62}\) Research show that we can not only lower our levels of stress by retreating to nature. We can also enhance positive arousal such as feelings of affection, friendliness, playfulness, and euphoria.\(^{63}\)

The positive affect is not limited to be linked only with the nature itself rather it is natural elements that seems to be the component that can restore our energy.

7. Nature can not only release stress it could also give positive arousal.

**Light**

Bright light is not only a factor that decreases the perceived crowdedness, it is also a factor that helps us stay awake. Light helps the brain control the level of melatonin, the hormone associated with sleep-wake cycle. As we are asleep the levels of melatonin are high but as we start to wake up the level decreases. Light

\(^{59}\) Hildebrand Grant, *Origins of architectural pleasure*, Univ. of California Press, Berkeley, Calif., 1999 p. 645  
\(^{60}\) Arthur E. Stamps. op. cit., p.652  
\(^{62}\) Kopec Dak, Environmental psychology for design p.26  
helps the brain to stop produce melatonin and light therapy has successfully been used in treating sleep disorders and depression. It has been proved that natural light has a greater impact of treating depression than artificial light (2800 lux light-bulb).

Plants
Research show that plants in indoor environment also are stress reductive. The same research also indicate that the reason behind the stress reductive trait of plants could be because of a higher perceived attractiveness of the room.

Room layout
How the office space is spatially planed strongly effect the feeling of privacy and territorial issues. Studies have examined the relationship between stress and open-plan and have reports that people seems to be negatively affected by moving to a open-plan office. Research show that open-plan reduces privacy and is a stressor due to less perceived control. It also show that complaints from

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repositioned workers tend to be concentrated in increased distraction and
disturbance.\textsuperscript{70}

Not only was there a decrease in the satisfaction with the physical
environment, it was also an increase in stress. Neither did the negative effects
decline over time. Some negative aspect actually grew bigger, for example the
team member satisfaction.\textsuperscript{71}

There is some research suggesting that working in an open-plan create a
greater workload and worsen social communication. But on the other hand, that
desk sharing would increase communication.\textsuperscript{72}

9. Desk sharing increases communication.

Last but not least, one research has determined that it is the layout that \textit{alone}
determine the satisfaction of the place. Specific space considerations for example
sufficient storage and work surface area did not have a significant. The same
research points out contradiction in their findings with previous research. The
previous research show that satisfaction will rather depend highly on other design
variables such as noise control and sufficient light and space.\textsuperscript{73}

The position of furniture in a room could also have an effect. A room would
presumably be seen as more crowded if furnished in the center of the room rather
than along the walls.\textsuperscript{74}

\textsuperscript{70} ibid., p.129
\textsuperscript{71} Brennan Aoife, Chugh Jasdeep S., and Kline Theresa, op. cit., p.282
\textsuperscript{72} De Croon Einar M., op. cit., p.129
\textsuperscript{73} Brennan Aoife, Chugh Jasdeep S., and Kline Theresa, op. cit., p.294
\textsuperscript{74} Nayyar P. Sinha and Mukherjee N. Perception of crowding among children and adolescents. \textit{The Journal of
Room size

The room size could be explained as dependent on the room before. Expectations can be created by the pre room and will determine how we perceive the spatial experience in the actual room. A grand entrance could create great expectations which could be fulfilled when entered the actual room, or destroyed. We could experience the room as smaller if the expectation was a great room. As well as the opposite, perceiving the room bigger thus the expectation was a small room.  

In Sweden, there are no rules about how an office room should be spatially planed but there are guidelines provided from the Swedish work environment act "Arbetsmiljöverket". According to them it should be calculated approximately 25kvm\(^2\) per person. This would include all areas such as meeting rooms, storage, hallways, social areas, and the work place. Independent if the office space is open-plan or traditionally room divided. A traditional office room could rarely be smaller than 8-10kvm\(^2\) for one person and for a shared room around 15kvm\(^2\). This is estimated for fulltime workers and could be made smaller in specialized workstations.  

75 Branzell Arne, Något om .... liten skissbok om det upplevda rummet, op. cit. p.13
76 Arbetsmiljöverket (av.se). Inga minsta storlekar för rum. 2013. Viewed 26 april 2013
Empirical knowledge

Maintpartner AB has requested a office space that will work as their new Swedish headquarters. The office space will be located at the third floor and facing the north. Out of the total of approximately 1000kvm² on the third floor, around 280kvm² should be chosen for Maintpartner AB’s office. Most of the walls can be changed and are not predetermined. The few predetermined walls are marked with red in the plan below, picture 10. The black covered area on the same picture belongs to another company.

Maintpartner AB want to create an office space for twelve people with different positions but with all administrative responsibilities. The office must have the possibility to host two extra consults from time to time.

Social aspects

Maintpartner AB’s administrative staff has today a work space made for operators. This is notably especially in the dining area, which is planned to be used with dirty clothes. The administrative staff are not frequent users of the eating area, neither when it comes to lunchtime nor coffee breaks. Instead, the interviewees showed that the majority takes their coffee to the work area, while answers from the survey indicate that lunch is consumed in the eating area every second time.

The majority of the people in the interviewed group believe that a more attractive dining area would attract people to eat lunch at work. The CEO misses a

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77 Ringman, Jennie; Human resources, Conference room at Maintpartner Årsta interview with photo diary, 19 April 2013.
more close social relationship among coworkers and advocate a workplace where people want to stay after work for social reasons.\textsuperscript{78}

The majority of the staff reported that there is no disturbing conflicts at the company, except the newest member. But why he is the only one, can only be speculated around. Could this be between administrative personnel and operators or is it because he has not yet been included in the workforces? Or could this be explained by a general harsh atmosphere?

The survey also reveal the perceived social atmosphere at Maintpartner AB’s office. In the survey the personnel graded the match of each statement, seen in picture 11, the data was then interpreted by its medial. Mainly people claimed that the atmosphere is relaxed and friendly as well as encouraging and supportive. But some would also say that it is quite competitive, if this is perceived in a negative way or as a positive competition is not distinguished. But by examine the relationship between the value of competitive-oriented environment with the positive values (relaxed and friendly and encouraging and supportive) I found that it is mostly associated with those positive. My conclusion is therefore that the competition is a positive one as well as the overall atmosphere.

![Maintpartner's collected social environmental view](image)

11. Social environment summarized medial percentage in a circle diagram

\textsuperscript{78} Skugge, Per; CEO. Telephone, interview with photo diary, 22 April 2013.
Work conditions

At Maintpartner AB, the personnel report through the survey that they have to work in a high tempo. Some of the interviewed report that they have to bring work home during evenings and weekends, none of the interviewed takes coffee breaks. Further on, half of the asked staff has to work overtime quite often.

Their office situation today, according to the survey, is ranked as satisfying by half of the staff. The interviews show another side, where no one were satisfied with the situation today. Some of the staff is missing a workplace and has to use temporary workplaces like momentarily free workstation, the meeting room or eating area.\textsuperscript{79} All the interviewed report being disturbed by phone calls from others or feeling as they are disturbing when they have to talk on the phone. Some of the staff members also have phone calls or documents that has to be kept undisclosed, which today is somewhat impossible.\textsuperscript{80}

All of the people interviewed via the photo diary showed mainly and most often only pictures of their work area. This indicate, to me, that they perceive their days as fixated at their desks. Even though the desk might not be a permanent work area they all had in common a computer on a horizontal surface and possibility to take notes. My interpretation, that the employed are fixated at their desk, was strengthen when the interviewed revealed that they seldom take coffee breaks, rather they bring the coffee to their desks.

Meetings and group work

The group of twelve to fourteen people that will be sitting at the new office is highly dynamic. In this case it means that the majority of the employees has very different responsibilities and work functions. Some need two screens, storage for items such as usb-drives to computers, and the possibility to regulate the high of the desk during a workday.\textsuperscript{81} Others mainly have the need to host meetings or to be able to work in a group, the traditional desk work space only has fit a laptop.\textsuperscript{82} Sometimes people need to be able to speak privately and sometimes they need to write private documents.

The different needs in the group could be summed up as highly individual.

\textsuperscript{79} Ringman, Jennie; Human resources, op. cit.,
\textsuperscript{80} Persson, Carina; Commercial Director, Individual workplace at Maintpartner AB Årsta. Interview with photo diary, 16 April 2013.
\textsuperscript{81} Ståhl, Kenny; IT Coordinator, Individual workplace at Maintpartner Årsta, Interview with photo diary, 16 April 2013.
\textsuperscript{82} Skugge, Per; CEO, op. cit.,
Observations

By observing the office space, which Maintpartner AB will move to, I gained a greater understanding of its potential. How did I subjectively experience the space and why, were the two first questions I asked myself.

The first view, see below at picture 12, contain a bathroom and a kitchen area on each side of the hallway. The hallway leads to a room with, some extent, glass walls filled with light. I immediately felt drawn to the lighter area. The corridor was just the hall, a transportation way where I didn’t want to stay.

12. Picture of the first view

The Second view, seen picture 14, had the same attributes. Yet again I felt an attraction and pulling toward the light at the end, even though light also came from the left side. As my observation showed it did not have any effect on my spatial experience of a consistent, elongated, room as can be seen in picture 15.
Location

The office space is located in Årsta, which is approximately 4km from Stockholm city center. Årsta consist of a great deal of greenbelt. The location of Maintpartner AB office is and will still be right next to a green field called; Årstafältet This areas is marked by orange lines in picture 16 below. This field
was covered by water until 4000 years ago and is considered an old cultural landscape.  

Maintpartner AB’s new office space will, by its long side, be directed towards the north and will be facing Årstafältet on the other. Since it is the last building it will on the left side, its long side, be facing a green area. Leaving the office surrounded by green outdoor environment.

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83Blomberg Ingela and Wehlin- Fürst Eva. Årsta, Stockholms hem, Stockholm, 1999. p. 28
The office space is located on the third floor, which gives a clear view over the green area. Even though there is a road and parking lot creating a distance. The floor level compensate the distance and the visual view is as seen in the picture 18.

18. The view over Årstafältet a rainy day in april

**Idea development**

My first ideas was colored by the fact that I did not want to create the pulling effect that dark and closed vs. open and bright gave. My sketches was then mainly focused on the idea of open-plan and where rooms were needed they would be places at the back wall with big windows. I focused on open-plan so that the light could flourish freely without any walls cutting the light of.

19. Sketch over the office space as open-plan

When I added the information from my theoretical research to my brainstorm the view on open-plan solutions was loosened. My theoretical report showed that room divisions was, alone, the best option. To understand the proportions I started sketching in Sketchup but I was still actively worked against corridors.
When I was sketching these ideas, see some above in picture 20, I realized two vital problems. First of all, I realized what corridors did, most often they lead the way. In none of my ideas I thought of that leading the way could be crucial for first time visitors as well as regular workers.

The second reason was space. The ideas with non-strait corridors as well as optimizing sunlight in every room created a lot unused space. The sketches above are somewhat over 400kvm². The Swedish work environment acts guidelines claims that this work environment should be around 300kvm² if twelve people would work there and 350kvm² when they were fourteen. The limitations from the company was on the other hand to be somewhere around 280kvm².

When I created my final concept I followed these guidelines

- Individuality in personal and work needs
- Possible control over personal space
- Possibilities to talk and meet customers or other coworkers undisturbed
- The meetings could be in a variety of combinations and amounts of people.
- Visual stimuli from natural elements such as plants and wood
- Optimizing the sunlight possible thrive through the office
- Enhancing the social interaction
- A workplace for 12-14 people
- The individual rooms should be around 8-10 kvm per person
- The office area should be $280 \times x < 350$ kvm$^2$
21. Finished design concept in perspektive plan with visual information
22. Location of the office on the third floor
Room division

Finally, how should Maintpartner AB’s new office space be planned so that it is minimized in stress, created from ambient environmental issues?

During the theoretical research I have found evidence that open-plan solutions are a inefficient way of planning a office space. This is because of the increased possibility to be disturbed which leads to more stress. Some studies are contradictive, some claim that it is the layout of the space that alone will determine the satisfaction. Other studies have evidence for variables such as noise or sufficient light and storage to have a significant factor.

These findings together with the work environment at Maintpartner AB, where conversations via phone as well as group work belong to everyday chores, make me assess the risk of disturbing others as high. Planed phone calls such as phone meetings or ones made by themselves don’t necessarily have to be a disturbing factor for others since it could be fixed by phone booths. The stress on the other hand could then come from both the constant reminder of the possibility as well as the actual movement away from your work station.

Together with open-plan the possible stressor that comes from the limitation of control over personal space in open-plan has made me construct Maintpartner AB’s new office space with somewhat traditional closed rooms.
Natural light

When it comes to natural light the ideal spatial plan would be open-plan so that the light could spread out without any limitations. Since research is contradictory on which is the most important aspect, layout or other variables in combination, my design proposal is based on a combination of both layout and the other variables.

Therefore, I have planned all of the rooms with as much glass as possible without taking away the feeling of privacy. This is so the natural light can flourish through the whole office as much as possible. To enhance the optional privacy even more, every part covered by glass can be somewhat covered by drapes as seen in the pictures 24, below.
The natural light in combination with the plan itself is suppose to create a certain flow. The area for eating and socializing is located so that personnel and first time visitors would be drawn to this area. Both when entering the front door as well as when they exit their offices. When entering the office space the eating area will be an Eye-catcher. Both because of the light flourishing through the row of windows as well as the visual opening. The attraction from the other perspective, the office room, will be dependent on the effect of the light.

The reason behind the aim of creating an attraction to the eating area is to fulfill the need of an enhanced social integration. Especially a promotion of coffee breaks and joined lunch breaks, that some of the workers whished for.

25. Plan marked with orange and yellow, demonstrating the flow

**Green areas**

The office space is located on the third floor and with quite a lot of green areas outside the windows. This helps reduce stress and will make the room feel bigger and less likely to be crowded.

Beside the green areas outside, natural element will be brought inside. This could implement wood details and a variety of plants.

26. Plan demonstrating the green areas
**Individuality**

In the design concept a traditional room division will be applied, at least to some degree. In this concept every room will be designed for the specific person’s requirements. See picture 27 and the individuality between the rooms. One person might need a place for both storage and a more conversational meetings apart from the working area. This type of office, therefore, has two extra relaxed chairs seen in the picture 28. Another person might need to add a table to the chairs in the corner so that the room would look as the one in picture 30. This room is a place for small workgroups for 2-3 people or more formal conversation or presentations as well as the previous, easier conversational meeting when the table has been removed.

Further on, a person's need to host relaxed meetings could be done by designing the room with a sitting area, as seen in picture 29. This room could also fulfill the need of changing the work position, working at the desk or doing a more relaxed work such as reading or talking on the phone in the sofa. Another room, seen in picture 32 fulfill the need of bigger workgroups or possibility to host a bigger group of customers or in-house meetings. In this room the need for storage is limited as well as the need for a big work area.

In picture 31 we can see a office space made for two people. This space could be used either by staff members who work closely together and would benefit from working close, without disturbing each other. This kind of room could also be used for workers who will only work part time at Maintpartner AB or the office in Årsta. The last room could be seen as a traditional office, see picture 32. The need of a great deal of storage and a big desk could also be accomplished in this design proposal.

With this variation of office spaces the individual need could be fulfilled. By separating the office space in rooms every person could have control over its own space, keeping the control over the personal space need intact.

27. Overview over individuality of the rooms
28. Storage and relaxed meetings

29. Sofa group for relaxed meetings or possibility to change work position.

30. Room for group work with 2-3 people

31. Room for group work or meetings 5-6 people, less need for workspace at the desk.

32. Room for two people working close or part time

33. Traditional office with a lot of storage and great desk space.
The office spaces that is not directly located at windows, facing outside, will not only have more plants and more natural element, which for example could be wooden walls, it will also be minimum one square meter bigger to compensate for the visual advantages in the other rooms. As research showed it is the visual escape that effect the perceived space.

34. Natural elements, such as plants and wooden details, in the office not located at the windows

35. Location is compensated in size as this room is 12,13kvm²

36. While the rooms located at the window for example are 8,1kvm²
Size should also be discussed when we talk about the total area of space. The entire office space in my design proposal is 318 kvm². According to the research this office space would have to be 350kvm² but that is when fourteen people are working fulltime. Since there will only be twelve people that has Årstas office space as their main workplace I would argue that the size is well balanced.

Meeting and social areas

There is also some areas for everyone's use; the meeting room, eating area, conversation room, and waiting/conversation area. These are constructed to complete the need of group work or conversations that cannot take place at the office room.

The area we meet directly to the left when entering the office consist of a small red meeting area as well as a big meeting room see picture 37. By looking at picture 48 a clearer view, on exactly where this is on the plan, is provided. The first meeting area, the circular closeable areas, purpose is short meetings with either customers or coworkers. It also works as a waiting area for customers and a perspective view could be seen in picture 38. The possibility to close this area will gain conversational privacy but the walls, preferably made of PVC plastic, is somewhat transparent. Therefore it is not sufficient for private long meetings rather short and somewhat casual ones. The idea behind not making this area completely covered or the possibility to do so, is so that overlooking the entrance and corridor could be constant from this point.

37. Overview of the first meeting areas when entering the office space
The second room showed on picture 39 is the bigger meeting area. It is covered by glass and has one side of windows. It is designed to feel open and with a lot of visual escape since it is a room constructed for at least ten people. The glass area will on the other hand have the possibility to be screen of so that private matters could be shown. This room is designed for both internal or external meetings.

38. Perspective view over the inside of the big meeting room

39. Perspective view over the circular meeting area preferably done in PVC plastic,
The eating area could be seen as one of the most important areas in this design concept, not only is the layout planed so that we are led to this area. This is also the area that will connect the workers. The eating area is made big and without walls limiting the space as seen in picture 40. This should not be a space someone can claim and it should be a central part of Maintpartner AB's work environment. People should rather eat in the eating area than at their own desks. As seen in picture 41 the chairs are a bit higher so that the outdoor view could be seen while seated.

40. Overview over the layout of the eating area.

41. perspective over the eating area
The conversation room, a place where both conversations between coworkers and customers could take place. It could also work as an environment change for the staff. The room consists of a relaxed seating and could work for a small group of approximately three people. Since the room does not have direct connection with windows showing the outdoor view it is compensated as the other rooms, with natural elements.

42. The over view of the conversation room

43. Perspective view over the conversation room.
At the end of the hall there is an additional area for workgroups or meetings. This area cannot be closed off and should work more as a spontaneous work place. That means that this area cannot be directly booked. It is without walls and kept open since it is located in the intersection of the outer walls, the walls with windows. This area will flourish with light and be an attractive work area.

44. View over the open work area.

45. Perspective view over the work area at the end of the hall.
Last but not least there is a room for the copy machine and extra storage, as seen in picture 46. This room will only be used by workers at Maintpartner AB and is located somewhat in the middle of the office space as seen in picture 47, where the copy room is marked with a red square.

46. View over copy room

47. With a red square the copy room is marked
48. Explanation on where the pictures are taken from by number associating to the number of the previous pictures.
Discussion and conclusion

The purpose of the thesis was to create a greater understanding of what human being perceive or feel as stressors in the environment. Further on the purpose was to apply this knowledge on the design proposal for Maintpartner AB's office space. Maintpartner AB is a company dealing with industrial maintenance and operation service.

Via the theoretical framework, where I have looked into the subject of environmental variables affecting humans in stress context, I have found rich evidence of the environmental influence. Including the idea that the less perceived space the greater need for physical space. Perceived space is dependent on variables such as visual escape. Both the level of the floor as well as the height of the room are factors that affect how it appears. By bring nature closer to us we can gain the positive outcomes as it works as a stress releaser. The possibility to control your private personal space is also a factor that could decrease stress, intrusions on belongings as well as the physical attached boundaries could lead to several feelings associated with stress.

It could be discussed if my thesis would need a broader or deeper research area, as the framework is quite general. However, it would not be realistic with a more broader and deeper frame in a thesis on this level. The factors that I did not include might have affected the design proposal and it can only be speculated if they would support my design or oppose. I would specifically be keen on conducting a concentrated research in the field of group dynamic and personalities, how this affect the room perception. Stress is a individual feeling and further studies could go deeper on the individual view and perception of stress.

In my design proposal I have brought together the theoretical as well as the empirical findings. As my understanding for the company has grown bigger I realized the great complexity behind planning their new office space. Every person has different need and deeper research, before determination of the final layout, regarding the specific needs of every person would be needed. In my proposal I therefore suggest a variety of room layouts to show the possibilities.

Since my thesis was conducted in close relationship with Maintpartner AB I have also gained knowledge in further job related problems such as, communication. As a student presenting for teachers and students in my own field of work, information design or the general field design, it is easy to forget that we develop a technical terminology. I believe that this has resulted in some problems in collecting the data from the employees. As some people misunderstood the photo diary, which resulted in unusable data and could not be used in the empirical findings, and others have been hard to reach. Amanda Löwenberg, my co student, and I did, in the beginning, receive ambiguous information regarding
various questions such as the number of people that will be placed at the office in Stockholm.

In conclusion, my design proposal is an office space where Maintpartner AB will be able to have a stress free work environment. They will also have the possibility to individualize the separate spaces as well as vary the work position. Meetings and workgroups will be dynamic and the different needs be fulfilled. I have not, in the range of this thesis, had the possibility to conduct any testing on my final proposal. I believe that minor issues could occur when this would be executed but I rely on my research and my knowledge that this will be a successful design. Knowledge gained from three years of studying information and spatial design. As well as my one year of study awareness psychology, neuropsychology and philosophy.

49. Final design proposal
References

Articles


Dijkstra K., Pieterse M. E., and Pruyn A. Stress-reducing effects of indoor plants in the built healthcare environment: The mediating role of perceived


**Books**


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**Personal Communication**

Persson, Carina; Commercial Director, Individual workplace at Maintpartner AB Årsta. Interview with photo diary, 16 April 2013.

Ringman, Jennie; Human resources, Conference room at Maintpartner AB Årsta. Interview with photo diary, 19 April 2013.

Skugge, Per; CEO. Telephone, interview with photo diary, 22 April 2013.

Ståhl, Kenny; IT Coordinator, Individual workplace at Maintpartner AB Årsta, Interview with photo diary, 16 April 2013.
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Annex

Annex 1. Assignment photo diary.
Fotodagbok 3-10 April
Hej!
Vi är två snart nyexaminerade inredningsarkitekter och som vårat sista steg innan examen har vi fått i uppgift att göra era nya lokaler i Stockholm.
Denna dokumentation önskar vi att du kan göra från den 3 april till och med 10 april.
Så snart du är klar kommer vi boka in ett möte med dig där du får göra en "av tankning". Ett kort möte där du berättar om vad bilderna föreställer eller betyder.
Tack för din medverkan!
Har du några frågor eller kommentaren uppgiften ring eller mejla mig på 0708395952 eller malin-jacobsson@hotmail.com

Annex 2. Survey questions, "Din arbetsplats"

<table>
<thead>
<tr>
<th>Svaralternativ</th>
<th>Medianvikt</th>
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<tbody>
<tr>
<td>Ja, alltid</td>
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<tr>
<td>Ibland</td>
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<td>Nej, aldrig</td>
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Hur mycket tid spenderar du vanligtvis på kontoret i Stockholm? *

<table>
<thead>
<tr>
<th>Arbetsprestation</th>
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<tbody>
<tr>
<td>Måste du arbeta övertid? *</td>
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Måste du arbeta i mycket högt tempo *
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**Tycker du att ditt arbete är meningsfullt?** *  
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**Besök**  
Innefattar ditt arbete kontakt med kunder eller klienter? *  
- ☐ Nej  
- ☐ Ja, mest indirekt kontakt (genom ex. post eller mail)  
- ☐ Ja, mest direkt kontakt (genom ögonkontakt eller telefon)  
- ☐ Ja både indirekt och direkt kontakt

**Hur ofta kommer du i framtiden att ha kunder eller klienter på plats?** *  
- ☐ Färre än 1 per månaden  
- ☐ 1-4 per månad  
- ☐ Flera gånger i veckan  
- ☐ Varje dag

**Eget val**  
**Kan du själv bestämma din arbetstakt?** *  
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**Kan du själv bestämma när du ska ta paus?** *Paus innefattar ett avbrott från arbetet i mer än 5 min*  
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**Kan du själv bestämma över hur lång paus du tar?** *  
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**Kan du bestämma din egen arbetstid (flextid)?** *  
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<td>Uppmuntras de anställda på din arbetsplats att göra förbättringar? *</td>
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<td>År det tillräckligt med kommunikation på din avdelning? *</td>
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<td>Arbetar du i grupp? *</td>
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<td>År du i behov av gemensamma arbetsytor? *</td>
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**Omgivning**

Vad tycker du om din omgivning?

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<td>År du nöjd med din arbetsyta?</td>
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Vad tycker du kan förbättras med din arbetsyta?

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<td>Känner du dig tillfreds med ert mötesrum idag? *</td>
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Inte alls   |  |  |  |  |  |   |   |   |
Mycket mycket
Vad tycker du kan förbättras med ert mötesrum?

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Hur ofta äter du lunch i ert gemensamma fika/matrum? *

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Aldrig |  |  |  |  | Alltid

Känner du dig tillfreds med de fika/matrum ni har idag? *

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Inte alls |  |  |  |  | | Väldigt nöjd

Vad tycker du kan förbättras i ert pausrum/kök?

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Annex 3. Results from the survey gathered in bars

- Är det tillräckligt med kommunikation på din avdelning?
- Arbetar du i grupp är du i behov av gemensamma arbetsytor
- Är du nöjd med din arbetsyta?
- Är ditt arbete kreativt?
- Uppmuntras de anställda att göra förbättringar?
- Kräver ditt arbete maximal uppmärksamhet?
Kan du bestämma själv över din arbetstakt?

Kan du själv bestämma när du tar paus?

Kan du bestämma din egen arbetstid?

Har du lagt märke till störande konflikter mellan arbetskamrater?

Måste du arbeta övertid?

Måste du arbeta i mycket högt tempo?

tycker du att ditt arbete är meningsfullt?
Kan du bestämma hur lång paus du tar?
Hur ofta äter du lunch i ert gemensama fika/matrum?
Känner du dig tillfreds med de fika rum/matrum ni har idag?
Känner du dig till freds med ert mötesrum idag?