Knowledge sharing through co-presence: added value of facilities

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Abstract

Purpose – The aim of this paper is to find suitable measures that facility managers can use to prove the importance of a building for employee behaviour (and thus organizational performance). The amount of knowledge sharing between colleagues is studied, because it influences innovation, which is one of the most important organizational goals these days.

Design/methodology/approach – Knowledge sharing in open plan areas is studied with the help of measures derived from spatial network analysis methods. Data were collected from 138 employees working together in a research building and used to show the effect of co-presence on the amount of knowledge sharing and the way knowledge is shared.

Findings – Co-presence explains 12 percent of the variability in the number of knowledge-sharing meetings. Also the way knowledge is shared differs between people working in co-presence and people who have separate rooms/areas. Spatial network analysis is an adequate way to describe open plan workplaces.

Originality/value – Previous studies do not define openness in such a way that different open plan layouts can be assessed and compared. This is necessary for facility managers to make grounded decisions. This paper applies a new methodology for these types of studies. Also it studies the effect of facilities on actual knowledge-sharing activities, and not just on interactions between people.

Keywords Knowledge management, Facilities, Employees behaviour, Open plan offices, Cost benefit analysis, Organizational performance

Paper type Research paper

1. Introduction

Decisions about facilities used to be made on a property-by-property basis with no overall strategy. Also, these choices were often made without consultation of and coordination with other important business units, such as human resources, technology, capital and communication (Gibler et al., 2002). Lately, facilities are getting more attention from general management, because the added value of the workplace has been proven for employee behaviour. For example productivity and satisfaction are influenced by indoor climate and lighting (Sundstrom et al., 1996), privacy and storage space (van der Voordt, 2004) and having a window to look outside (Madhavi and Unzeitig, 2005), to give just a few examples.

Although the main goal of general management for facilities might always be to limit the high costs of this resource (2nd highest after cost of labor), the focus appears to be moving towards a cost/benefit ratio. And “benefit” in this ratio should be seen as a broader term, than just direct or indirect return on the investment in real estate. Lindholm and Levänen (2006) identified five additional ways in which facility management can add value to the organization. Besides direct return (“Reducing..."
costs”), indirect return (increase in the “Value of assets”) and “Increasing flexibility”, they mention four effects through behaviour, namely:

1. promoting marketing and sales;
2. increasing innovation;
3. increasing employee satisfaction; and
4. increasing employee productivity.

Increasing innovation and knowledge sharing is a goal of many organizations these days, but it is studied a lot less than productivity and satisfaction of employees. Literature studies (Heerwagen et al., 2004; Brager et al., 2000) do mention that a building might be able to add value to knowledge sharing by providing a floor/building layout that offers interaction between employees and a certain awareness of each other. Rashid et al. (2005) mention two spatial behaviors that are responsible for effects on people, namely movement (number of people moving along a path) and co-presence (number of active and/or inactive people visible). Besides literature studies, architects in practice claim to design new research buildings in such a way that they specifically stimulate knowledge sharing through open areas, special meeting places, etc. The problem for facility managers is, however, how to prove to general management that a new (or improved) building will indeed stimulate knowledge sharing, and thus is worth the investment. So far this proof has not been given, and an important reason is the lack of suitable building measures. As Franz and Wiener (2005) state, previous studies “relied on qualitative descriptions of selected features of space, which makes them difficult to compare.” So finding suitable measures is necessary to help prove the importance of a building for knowledge sharing, and this is the goal of this paper.

Section 2 gives an overview of the process of knowledge sharing between employees. The next section describes a literature study on the relationship between building aspects and knowledge sharing, and shows the shortcomings of the measures used up until now. Then a case study will be described, in which a methodology called spatial network analyses is tested for its suitability to prove the added value of facilities for knowledge sharing, followed by a discussion and recommendations for further research.

2. Knowledge sharing

Knowledge sharing can only take place between people through some form of communication (Te’eni, 2006). Although communication in itself is a complicated issue, it is often portrayed by academics with a simple linear model developed by Shannon (Shannon and Weaver, 1949). To set up a similar model for knowledge sharing would lead to a more complicated picture (see Figure 1). Shannon’s model would have to be extended with the distinction between data, information and knowledge (Meadow and Yuan, 1997); a hierarchy which still causes a lot of discussion among knowledge management academics. Also, the linearity will disappear. den Otter (2005) describes a first circular relationship: “the judging of data, its possible acceptance as information, and its incorporation into a knowledge base all depend on use of the existing knowledge base.” This implies a continuous loop in the model in the mind of the receiver. A second loop would be based on the necessity of feedback (McKinnell
Jacobson, 2006) to make sure that the knowledge was shared. A third loop is created based on academics looking at knowledge as a dynamic concept (Spiegler, 2003; Nonaka and Takeuchi, 1995; van Daal et al., 1998), namely as “the capacity for effective action” (Spiegler, 2003). The actions one can undertake with knowledge will lead to the creation of new data. Weggeman (1997) portrayed part of this circularity in his model to define knowledge.

Activities that lead to knowledge sharing have been identified through observation of researchers in their work environment by Berends (2003). He identified a taxonomy of 29 “moves”; a move being a meeting during which knowledge is shared in a certain way. They are grouped into five categories which are very suitable to use as measures for knowledge sharing in an organization, because they are very common words (see Table I).

Knowledge management academics often make a distinction between explicit knowledge (information) and tacit knowledge (experiences, skills, attitude), first distinguished by Polanyi (1966). While certain meetings have been shown to help in sharing explicit knowledge, it is said that they are not always enough to share tacit knowledge. Giving “descriptions” is such an interaction; reporting on explicit information in either an oral or written form. For tacit knowledge sharing (which is more difficult, but also more important), collaboration is better suited (Kahn, 1996). This is identified with meetings involving “actions”, “questions”, “proposals” and “evaluations”. Another important aspect is the intentionality of an interaction; did one of the participants of the meeting purposely walk over to the other to talk or did they meet by coincidence. For meetings that are scheduled in advance it is very likely that they have not been a result from the building design. Organizational structure and projects at hand are more likely to steer who schedules meetings with whom to discuss certain things. For an analysis of the impact of layout, it is best to exclude these meetings from the analysis. Since this paper focuses on behaviour, methodologies that try to measure certain types of relationships between colleagues (e.g. social network analysis) or the perception of workplace users of their environment (e.g. mental maps) are not discussed, although they are shown to be very valuable for this field as well (Vartiainen, 2006).
3. Presumed impact of the building on knowledge sharing

Rashid et al. (2005) mention two spatial behaviors that are responsible for face-to-face meetings of people: movement (number of people moving along a path) and co-presence (number of active and/or inactive people visible). Nonaka and Konno (1998) emphasize that Polanyi’s tacit knowledge component can only be exchanged through joint activities, as spending time/living in the same environment. This implies that co-presence is the most important effect of a building on knowledge sharing. People in close proximity interact more, because they bump into each other when moving around in the vicinity of their workplace. Allen (1977) pinpointed the limit for this effect at about 30 meters. Later, he also explained that the type of communication that promotes creativity, tends to be the most affected by spatial arrangements and occurs in spontaneous encounters (Allen, 1997). This condition of serendipity is also the reason why the virtual environment has not been included in this study. Although more and more technologies are developed to imitate co-presence, the virtual environment still seems to be efficient for circulation of explicit knowledge sharing only (Nenonen, 2005) and cannot replace the necessary face-to-face communication (Allen and Henn, 2007). “...IT tools lack the idea generation capability and serendipity of personal, face-to-face conversations.” (Apostolou and Mentzas, 1999).

So how does physical co-presence affect knowledge sharing? A content analysis of literature from the 1990s until 2007 shows that knowledge sharing is not mentioned...
specifically as the intended goal in most of the layout studies. Instead similar and broader terms like cooperation or interaction are used. These studies focus on office-type buildings, what makes them easier to compare and to generalize their results. The office measures that are mentioned by the different authors are grouped in Table II. For Co-presence, three different measures were mentioned by these authors:

1. visual/aural accessibility;
2. proximity; and
3. meeting areas.

Research-driven organizations often work both in offices and in laboratory settings, which can exist within one building. These buildings do not have typical office layouts like the ones studied by the authors in Table II. Studies of these types of research buildings are very scarce in real estate and facilities literature, but some academics from architectural schools did have a look at them (Serrato and Wineman, 1999; Penn and Hillier, 1992; Hillier and Penn, 1991; Hillier et al., 1990; Hillier et al., 1985). Proximity and visibility were mentioned as relevant aspects in these studies too, although the findings on their effect were not as clear.

Two important shortcomings can be mentioned with regard to these office and laboratory building studies. First of all, these studies measure communication, without taking into account whether work-related knowledge is shared. The data report only on frequency of communication. Sometimes the duration of a conversation is taken into account too (e.g. Becker and Sims, 2001) or the movement through the building (e.g. Penn et al., 1999). But all conversations could just as well be about how somebody likes their coffee, and thus not providing much added value for the organization’s body of knowledge. Covi et al. (1998) came closer to the issue of co-presence and collaboration, by asking respondents about their awareness of each other when using dedicated project rooms. But that was a perceived awareness, and it is not measured if the awareness helped in sharing knowledge. The cases described by O’Neill (2007) also asked for the perceived improvement in collaboration. Ward and Holtham (2000) and Heerwagen et al. (2004) do discuss knowledge management/innovation in more detail, but relate facilities to it based on literature study of (similar types of) studies; they do not provide empirical evidence. So it is not clear in the current literature if the layout has provided added value for the organization through increased knowledge sharing; there is only an increased amount of conversations. There are plenty of studies pointing out the disadvantage of increased talking on the work floor, through lack of concentration and other items negatively influencing productivity (Oommen et al., 2008; Evans and Johnson, 2000).

The second, and most important, shortcoming is how co-presence is measured. A few ways of measuring can be distinguished, each with its own flaws:

1. Different types of spaces (Covi et al., 1998; Brager et al., 2000; Becker and Sims, 2001; Nenonen, 2005; O’Neill, 2007) → it is hard to extend a certain type of space to other buildings, because they might function differently there. It is disprovable, whether the visibility or openness of such a space is the same in a different layout or building. Also, they have not defined these rooms quantitatively.

2. Before vs after collocation (Becker et al., 1995; Moenaert and Caeldries, 1996; Kahn and McDonough, 1997; van de Bulte and Moenaert, 1998; O’Neill, 2007) → longitudinal studies are interesting, but very case specific. The same employees
Table II.
Co-presence aspects with an effect on interaction

<table>
<thead>
<tr>
<th>Co-presence aspects</th>
<th>Visual</th>
<th>Aural/aural accessibility</th>
<th>Proximity</th>
<th>Meeting areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountert and Gaddies, 1995</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
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<tr>
<td>Beker et al., 1997</td>
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<tr>
<td>Hargadon and Sutton, 2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word and Halihim, 2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Becker et al., 2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rashid et al., 2004</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Heerwagen et al., 2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O'Neill, 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shpuza, 2006</td>
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</tbody>
</table>
have a certain amount of communication before and after being collocated with
different colleagues. Often organizational changes are made parallel to this
regrouping decision, making it hard to separate the effect of the building on its
own (Bell and Anderson, 1998). Also, this cannot be projected on a design
decision of a different organization, which makes these studies less useful for
facility management decision making.

(3) Topological configuration (Grajewski, 1992; Penn et al., 1999; Rashid et al., 2006)
although these types of studies are quantitative, the metric properties of
spaces are lost in theses analyses only leaving the way workplaces connect to
each other (Ratti, 2004). The methodology is often used for studies dealing with
unfamiliar places and way finding (many times on an urban level), where
visibility over longer lines is more important in guiding people than actual
distance (O’Neill, 1991). Haq and Zimring (2003) point out several studies that
have shown that people get a different mental representation of a building when
they get to know it, that has more accurate Euclidian properties.

So, although many researchers seem to believe in the importance of co-presence, the
proof for and working of its effect is still dubious. The openness that creates co-presence
through visibility is not defined in such a quantitative way that different open plan
layouts can be assessed and compared. This is necessary for facility managers to make
grounded decisions on the issue. The next section will therefore discuss measures from
spatial network analysis that were tested in a case study for their suitability to describe
co-presence of open plan layouts. The case itself is discussed in section 5.

4. Co-presence measured with spatial network analysis
In a spatial network analysis, the open areas in a building (or urban area) are described
with regard to their connections with other open areas. This way each area, or certain
spot within it, can be described in two ways, namely:

(1) with its own features (e.g. size, shape); and
(2) with its relation with other relevant areas or spots (configuration).

Spatial network analysis has been done with a broad range of methodologies both to
describe spaces and to determine the configuration. Especially the space syntax
community has applied several spatial network methodologies to a broad variety of
spatial issues It would go too far for this paper to explain all these methods, especially
because they are not all relevant. Two of them are explained and applied in a case study,
namely Isovist analysis and Visibility Graph Analysis. These were chosen for their
relevance in the context of describing co-presence; they are purely based on visibility. An
appealing side of isovists and visibility analysis is that they provide a description of
space as how the user perceives it, interacts with it and moves through it (Turner et al.,
2001; Turner, 2003) and has the potential to reveal more of the life that occurs in a space
than by just studying the space itself (Peatross, 2001). A big advantage of spatial
network analysis in general is the fact that special software exists that reads
architectural drawings form AutoCAD. So the computer automatically appoints
information on a workplace’s features and its configuration values, that can be
correlated to performance measures or used for facility management related discussions.

An isovist as defined by Benedikt (1979) is “the set of all points visible from a
given vantage point in space and with respect to an environment”. The viewpoint of
the isovists will be the place where the employees are working behind a computer. Their vision can be obscured by walls, partitions, file cabinets, etc. This way the features of a workspace are generated. For getting information on the configuration based on visual accessibility, Turner et al. (2001) further developed the thoughts behind isovists into Visibility Graph Analysis (VGA). To perform VGA a grid with many points (e.g. 50 x 50 cm) is placed over the building layout. On this grid a selection of points has to be made to form graph edges between those points that are mutually visible. If the entire layout is selected, each point in the building will be appointed information on its (topological) distance to all other points. If only the grid-squares that represent someone’s workplace are selected, VGA describes the features of open spaces with several employees that can see each other (in co-presence). The configuration to other open spaces in the same building that cannot be seen directly by this group of employees is not taken into account anymore. Since we are trying to describe co-presence, this is the type of VGA that has been used in the case study.

For visual/aural accessibility, the isovist area and isovist perimeter seem relevant measures, because they define the potential number of people that could have their workplace in sight. Also, isovist occlusivity (m² of the perimeter of the isovist that is not formed by a solid object and thus permeable) seems a suitable measure, because it explains how visible a (group of) workplace(s) is for people walking around. Batty (2001) used a measure of isovist compactness (average distance/maximum distance). A more compact place seems to be closer to representing co-presence, because seeing someone work at the end of a long hallway does not provide aural accessibility for example. Another interesting measure for visual accessibility in an open plan area is the visual number of workplaces. This can be counted by hand, but it can also be measured by the connectivity measure of a VGA.

As a measure for proximity, the metric mean depth measure of VGA will be used. This is the average distance to all workplaces within visibility, so it measures whether people are located in the centre of an open area or at the periphery. It is generated by using the VGA grid to move, so all obstacles on the route (walls, etc.) have to be evaded, and then measuring the metric distance to each person in sight.

Since meeting areas are meant for interaction, observation showed a non-surprising result that a lot of talking takes place in them (Penn et al., 1999). These are mostly planned meetings though (as discussed before), and not so much a result from the layout. Also, a study of four organizations by Rashid et al. (2006) showed that no more than 11 percent of the meetings took place in a meeting room anyway. The case study (discussed next in detail) confirms this, because only 5.6 percent of the meetings took place in meeting rooms, of which 80 percent were planned meetings. So no measures will be tested with regard to meeting areas.

5. Results of a case study
The case study was performed within a two-storey building on the research campus of a large research organization in The Netherlands (see Figure 2). As can be seen in the layout, the building contains several different types of open plan areas, varying from group offices with three workplaces to large open areas with up to 29 workplaces. Small lab areas without daylight are concentrated around the corridors, and a few large lab areas with less specific climate conditions are located in areas similar to the offices.
Knowledge sharing through co-presence

Figure 2. Layout case study building
The spatial network analyses were performed with software called Depthmap (version 7.12) on a grid of 500 mm. The data on knowledge sharing were gathered during one week (in October 2007), during which 138 employees filled in a logbook about each knowledge-sharing meeting between colleagues working in this particular building. They also indicated where inside the building each exchange took place. Only knowledge sharing between participants of the study is analyzed. The participants constitute 51 percent of the entire building population and their workplaces are dispersed over both floors of the building. Their office workplaces are located in rooms/areas varying from one up to 17 participants; each group size within this range is represented in the sample, except an area with 16 participants.

The logbooks provided 918 knowledge-sharing meetings, most of which took place between two persons (93 percent, vs 6 percent between three persons and 1 percent between four pers.). During 56 percent of the meetings knowledge was shared by asking and answering questions, while the other four knowledge sharing activities only took place during 17-22 percent of the meetings (see Table III). Most of the meetings took place at a workplace (78 percent), and the lab areas account for 14 percent of the meetings. Very few unscheduled meetings took place in the meeting areas, but more surprisingly, the hallway or coffee machine also did not accommodate many unscheduled work related meetings. Perhaps, the coffee machine is more a place of informal talk about non-work related matters. Or maybe people forgot to log these meetings, although it does not seem likely that this would explain such a large difference with meetings at the workplace.

Table III also shows that in 28 percent of the meetings, people started sharing knowledge because they happened to bump into one another. These coincidental meetings take place significantly more often in the hallway and at the coffee machine than the intentional ones ($\chi^2 (16, n = 1,870) = 29.60, p = 0.02$). For 72 percent of the meetings, people decided to walk over to the other person, or have their workplaces so close that they can talk with one another from behind their desk.

<table>
<thead>
<tr>
<th>KS activities</th>
<th>Frequencies</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptions</td>
<td>423</td>
<td>22</td>
</tr>
<tr>
<td>Actions</td>
<td>321</td>
<td>17</td>
</tr>
<tr>
<td>Questions</td>
<td>1,067</td>
<td>56</td>
</tr>
<tr>
<td>Proposals</td>
<td>372</td>
<td>20</td>
</tr>
<tr>
<td>Evaluations</td>
<td>395</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location of interaction</th>
<th>Frequencies</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own workplace</td>
<td>802</td>
<td>42</td>
</tr>
<tr>
<td>Workplace of other</td>
<td>684</td>
<td>36</td>
</tr>
<tr>
<td>Meeting area</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Lab</td>
<td>274</td>
<td>14</td>
</tr>
<tr>
<td>Coffee machine</td>
<td>81</td>
<td>4</td>
</tr>
<tr>
<td>Hallway</td>
<td>39</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table III.** Values of knowledge-sharing measures in the logbooks

<table>
<thead>
<tr>
<th>Intentionality</th>
<th>Frequencies</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentional unscheduled visit</td>
<td>1,358</td>
<td>72</td>
</tr>
<tr>
<td>Initiated after coincidental visual contact</td>
<td>533</td>
<td>28</td>
</tr>
</tbody>
</table>
It is likely that the spatial network variables correlate highly, because the design aspects that they measure are very related. To study the influence of co-presence, first a correlation analysis of all the spatial network analysis measures was done to prevent multicollinearity in a multiple regression. This analysis revealed that the isovist measures “area”, “perimeter”, “occlusivity” and “compactness” and the VGA “connectivity” of the workplaces are not different measures for visual/aural accessibility. The correlation coefficients (see Table IV) vary from −0.496 (compactness with connectivity) up to 0.975 (perimeter with occlusivity). “Metric mean depth”, the measure for proximity, only correlates with “connectivity” and less strongly (−0.394), so this might be a different measure. Both were tested together with a stepwise multiple regression, because that would provide the highest $R^2$, with the least number of independent variables. For the facility manager it is easier, when just a few measures have to be used in describing the effects of the layout on behaviour.

In this case only “connectivity” turned out to be a predictor of knowledge sharing. It explains 12 percent of the variability in the number of meetings (sign. = 0.000). Proximity but without visual connectivity is excluded from the equation because it had no additional explanatory power. So the more workplaces in an open plan area, the more knowledge is shared within the total organization.

A $\chi^2$-test shows that the behaviour through which knowledge is shared differs between people working in co-presence and people that have separate rooms/areas ($\chi^2 = 27.7; \alpha = 0.000$). People that work in separate rooms perform more actions together and give each other less descriptions. Also, they have to ask each other more questions and make less proposals or evaluations together. Surprisingly, the amount of coincidental visual contacts that led to knowledge sharing versus intentional visits to share knowledge was the same for employees in co-presence as for employees from separate rooms. Apparently, serendipity is not spatially bound.

### 6. Discussion and recommendations

When the data on connectivity (number of people in visible co-presence) are put in a scatter plot against the number of knowledge sharing meetings (see Figure 3, top), it

<table>
<thead>
<tr>
<th></th>
<th>Isovist area</th>
<th>Isovist perimeter</th>
<th>Isovist compactness</th>
<th>Isovist occlusivity</th>
<th>Connectivity</th>
<th>Metric mean depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isovist area</td>
<td>1</td>
<td>0.933 *</td>
<td>−0.784 *</td>
<td>0.855 *</td>
<td>0.723 *</td>
<td>−0.106</td>
</tr>
<tr>
<td>Isovist perimeter</td>
<td>0.933 *</td>
<td>1</td>
<td>−0.879 *</td>
<td>0.975 *</td>
<td>0.627 *</td>
<td>−0.073</td>
</tr>
<tr>
<td>Isovist compactness</td>
<td>−0.784 *</td>
<td>−0.879 *</td>
<td>1</td>
<td>−0.855 *</td>
<td>−0.496 *</td>
<td>0.026</td>
</tr>
<tr>
<td>Isovist occlusivity</td>
<td>0.855 *</td>
<td>0.975 *</td>
<td>−0.855 *</td>
<td>1</td>
<td>0.563 *</td>
<td>−0.076</td>
</tr>
<tr>
<td>Connectivity</td>
<td>0.723 *</td>
<td>0.627 *</td>
<td>−0.496 *</td>
<td>0.563 *</td>
<td>1</td>
<td>−0.394 *</td>
</tr>
<tr>
<td>Metric mean depth</td>
<td>−0.106</td>
<td>−0.073</td>
<td>0.026</td>
<td>−0.076</td>
<td>−0.394 *</td>
<td>1</td>
</tr>
</tbody>
</table>

**Note:** *Correlation is significant at the 0.01 level (two-tailed)
becomes visible that an explanatory power of 12 percent is not that much. Plotted against the mean number of knowledge sharing meetings (see Figure 3, bottom) the influence of co-presence looks a little more convincing. It was to be expected that the relationship between co-presence and knowledge sharing is not extremely strong, because there are many other aspects that influence knowledge sharing. Berends (2003) identified a long list of aspects that affect knowledge sharing, with aspects related to the attitude of both transmitters and receivers (e.g. trust, motivation), to the organizational context (e.g. culture, orientation and formalization) and several other factors. This study shows that a layout that provides a lot of co-presence also increased knowledge sharing. Many organizations are game for any increase in knowledge
sharing that can be accomplished. The biological metaphor of the physical environment (O'Neill, 2007) sees the organisation as a dynamic system in which all elements interact. So, possibly the layout has an effect on many of these organisational aspects as well and thus increases its total effect. It would be interesting to study the relative effect of the layout with regard to the rest of the list. The challenge would lie in identifying all relevant factors and finding trustworthy measures for everything that can be used in one total analysis. It would create an even better foundation for the assessment of whether to invest in facilities (the layout) or in other resources.

It appears to be the case that employees are more inclined to use proposals and descriptions that they feel could help the other with his/her issues, when working in co-presence. Working together in an area makes it easier to provide unquestioned help, because the visibility gives information on what the other person is doing. Separated employees have to ask each other more and have to undertake actions together to share things that in co-presence may have been clear to both already. So they do not only share knowledge less often, but it might also be a different type of knowledge that they share because they show different knowledge sharing behaviour: they use different kind of activities for sharing knowledge. The type of knowledge that is shared during all identified activities should be studied further by knowledge management academics, followed by more multi-disciplinary research that includes examinations of spatial effects.

Going back to the interest to prove the value of facilities for organizations, this first test of spatial network analysis does provide proof of a certain effect. Also the methodology seems adequate to describe open plan areas more concretely. However, it seems like a very laborious method if the number of visible workplaces is indeed the best (and only) predictor. In that case it is easier just to count by hand. Further studies with isovists and VGA on other buildings and organizations and with other spatial network analysis methods on similar buildings might find additional interesting measures to describe open plan areas. Also the results suggest that open areas should contain as many workplaces as possible, which intuitively is certain that this is not the case. Additional studies should provide an idea of the number of workplaces in co-presence that would maximize the effect. Other behavioural effects of co-presence should be studied in combination with this, so that maximum organisational performance is pursued.

The advantage of spatial network analysis software is being able to read architectural drawings and have all information available with a mouse-click. This could give facility managers a powerful tool to prove their importance in supporting organizational behaviour. Programs like Depthmap, can visualize the measures onto the building layout, which makes the information better accessible for general management and other non-facilities people. Such a tool makes it possible to discuss different layout options and the effects they would have on the organization, and thus choose the right facilities strategy. On a more operational level, it could also be practical to use the visualizations to talk about who should sit where. And in discussions with the architect possible changes and variations in the design, immediately can be assessed on their impact on the organization. To conclude, it could help facility managers in discussions with both clients as suppliers, and support decision making with regard to different layout alternatives.
References


About the author

Rianne Appel-Meulenbroek joined the REMD Group in 2004 as an Assistant Professor. Previously, she worked as a consultant for Buck Consultants International and for the international consultancy and engineering group DHV, advising small and large organisations on all kinds of facility management issues (site selection, masterplanning, office design, programs of requirements, project management etc.). She focuses on facilities management and the way building design can support an organization, through productivity of employees, innovation, knowledge sharing etc. She uses innovative methods to support decision making with regard to building design among spatial network analysis techniques. She is a board member of the European Real Estate Society and of VOGON (Dutch Society for RE researchers), and a regular member of Corenet (global association for corporate real estate professionals). Rianne Appel-Meulenbroek can be contacted at: h.a.j.a.appel@tue.nl