How Does Your Knowledge Flow? Exercises in Spatial Syntax

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ABSTRACT

In the 21st knowledge economy organizations must invest in and leverage their knowledge and intellectual capital assets. The circulation and sharing of knowledge and intellectual capital is critical to investment and value. While the literature discusses four categories of factors that influence knowledge sharing, one category has been neglected – the design of the physical-spatial environment. This program introduces participants to the practice of spatial syntax and provides a hands-on opportunity for participants to map and assess the knowledge flows of their working environments. Session leaders will provide a Quick Reference Guide describing Hillier's (Hillier et al, 1983) fourteen spatial metrics, and instructions for applying them. Session leaders will act as coaches in applying justified graph methods to determine how an architecture enables or impedes knowledge flows. The program will conclude with participants sharing their observations. The results of the session will be reported back to the ASIST SIGKM community, and shared with the ICKM attendees.

KEYWORDS

Knowledge flows, workplace architecture, spatial knowledge, spatial syntax, organizational ecology

INTRODUCTION

In the 21st century, knowledge and intellectual capital are primary factors of production – they are critical sources of wealth generation for individuals, communities, and organizations. Knowledge is different from information – it lives only in the minds and actions of people. Knowledge as a capital commodity has different economic properties than physical and financial capital – it is not scarce; increases in value through circulation, loses value when it is taken out of circulation, is perishable. Interactions and engagements among individuals are essential to the exchange, use, transfer and preservation of knowledge. The peer reviewed literature suggests four general categories of factors that may influence whether and how individuals share knowledge, including: (1) attributes and characteristics of individuals (Bock et al, 2005; Fullwood Rowley ad Delbridge, 2013; Tohidinia and Mosakhani, 2010); (2) the type of knowledge being shared ; (3) organizational, cultural and social context (Brachman and Levesque, 2004; DeVries Van den Hoof and de Ridder, 2006; Ipe, 2003; Ismail al-Alawi, Yousif al-Marzooqi and Praidoon Mohammed, 2007) and (4) the nature of the sharing transaction (Cabrera and Cabrera, 2002; Helmstadter, 2003; Ke and Wei, 2007). Attributes and characteristics of individuals include their personality (i.e., self-worth, self-recognition, self-seeking, self-extension, self-image, and general motivations), the level of culture at play, their prior knowledge sharing experience, and their individual rational behaviors. The value and type of knowledge will determine at what level of compensation and reciprocity it may be shared. The organizational culture and social contact may be influenced by family culture, corporate, professional, educational, gender, economic class, religious or spiritual preferences, ethnic culture, as well as regional, national and global culture. The most rudimentary condition for the sharing and exchange of knowledge, though, is the opportunity for individuals to interact. A fifth category of factors - the spatial design of physical environments - has received less attention in the knowledge sciences literature. How does physical space impede or facilitate human interaction and knowledge sharing?

SPATIAL KNOWLEDGE AND SPACE SYNTAX

Buildings have physical forms that we see and spaces we move through. Architectural theory has traditionally focused on the physical form. Recently, space has emerged as a major influence factor in our daily lives. Space syntax (Hillier et al, 1983; Steadman, 1983; Steadman, 2000; Hillier and Hanson, 1984; Peponis, 19985) is a method for describing and analyzing the relationships between spaces in the design of a given space. Spatial syntax tells us how space might influence opportunities for knowledge sharing. Spatial syntax metrics (Table 1) are generated through the drawing of justified graphs. A justified graph is a graph in which a particular space is selected as the root, and the spaces in the graph are then described in terms of several metrics including, number of spaces, depth of individual convex spaces, integration value of the full space, functionality of each convex space, average depth of the entire space, connectivity of individual spaces, external permeability of the space, choice of movement through the space, the most integrated convex spaces, most segregated convex spaces, core convex spaces, occupancy rates, and probability of encounters.

Space Syntax Metric	Definition and Calculation

Space Syntax Metric	Definition and Calculation
Number of spaces	Count of physical spaces delineated by walls and doors, or physical barriers (partitions)
Depth of each convex space	The least number of syntactic steps that are needed to reach one space from another.
Average depth of the entire space	The average of all the depth measurements for each defined (convex) space.
Integration value of the full space	Static global measure for a whole space that describes the average depth of a space to all other spaces in the configuration.
Functionality of each convex space	Defined as administrative, faculty, staff, or technology support
Role and status of the individual occupying the convex space	Defined as faculty or staff for this research process.
Connectivity of each space	Count of the adjacent convex spaces attached to a physical space
External permeability of the space	Count of external access points to the organization's space
Choice of movement through the space	Number of routes through the space.
Most integrated convex spaces	Spaces that have the highest number of directly visible and walkable connections to other spaces.
Most segregated convex spaces	Spaces that have the fewest number of directly visible and walkable connections to other spaces.
Core convex spaces	Spaces that have highest levels of integration.
Occupancy rates	Actual rate or percentage of work day that any convex space is occupied
Actual or potential encounter rate	Combined metric that takes into consideration the schedules of space occupants, their travel throughout the day, and the probability of encountering other employees.

Table 1. Space Syntax Metrics, Definitions and Calculations

RELATIONSHIP OF SPACE SYNTAX METRICS TO KNOWLEDGE FLOWS

What is the relationship of Space Syntax Metrics to Knowledge Flows? The relationship of each space syntax metric and knowledge sharing impacts is described below.

- *Number of spaces* is defined as the number of spaces defined with barriers – walls, doors, partitions. Spaces should be designed with barriers that support the occupant's work. Where an occupant requires time to concentrate, walls should block out distractions. Where transparency and trust are key cultural values, barriers should be designed for visibility.
- Depth is defined as direct linkage - visible and walkable access - to other spaces. Depth creates an opportunity for casual and informal encounters, exchanges and knowledge flows. A higher *average depth* for an entire space suggests an equal opportunity for encounters for all occupants.
- Integration describes the potential links of all spaces and all occupants. Higher *integration values* maximize knowledge flows.
- A diverse *functionality of spaces* suggests that there are different ways to interact and exchange knowledge. A communal kitchen, mail room, copy room are places where occupants naturally gather. An organizational design that includes only individual spaces might tend to limit interactions.
- *Role and status of the individuals* occupying a space may influence the space size, affordances, and placement in the overall design. Nature of the office may facilitate or impede interaction and communication.
- Spaces which are physically *connected* tell us something about the proximity of occupants and the ease of access to their neighbors. Higher average connectivity suggests greater opportunities for casual and informal interactions, and for informal participation in conversations.
- External permeability pertains to boundary spanning in the knowledge sciences literature. Greater *external permeability* increases the probability of interactions and knowledge flows into the space from outside the unit.
- More *choices of movement* or paths through the space provides for more and different encounters, and to the level of control. Do staff need to walk past the manager's office to talk to others? Does it take 10 minutes to reach a co-workers office because there is only one long linear path to that office.
- *Core convex/defined spaces* are those which have greater opportunity for engagement and greater value in terms of knowledge flows.

- Occupants of *highly integrated* spaces may be advantaged for knowledge flows and interactions. Occupants of *highly segregated* spaces may be disadvantaged for knowledge flows and interactions over others.
- *Occupancy rates* is a critical factor for understanding knowledge flows, but is only lightly covered in spatial syntax analyses. Occupancy rate is defined simply as the percentage of available time that an occupant actually spends in the space. Where occupancy rates are low, spatial design is important but may not be a primary factor in predicting encounters. In fact, the actual or *potential encounter rate* is significantly dependent upon the occupancy rate.

PROGRAM DESIGN

The program is intended to be highly interactive. The room will be setup around workstations, easels and flipcharts. The program time will be divided into three sections. During the first 15 minutes, Dr. Bedford will provide a high level overview of spatial syntax and explain how the fourteen metrics are applied to sketches of an environment. The session leaders will distribute a Quick Reference Guide to each of the participants. The second portion of the program – 45 minutes in length – will be devoted to mapping and assessing spatial syntax of real world contexts. Participants will be invited to organize into groups where they will sketch out and apply the indicators. Bedford, Sappington and Garcia-Perez will circulate around the stations coaching participants. In the final 30 minutes of the program, coaches and participants will come back together to share what they have learned about their spaces and current knowledge flows. The group will consider the implications of the exercises for the field of knowledge sciences generally and to knowledge transfer and exchange theory in particular. The group will also share thoughts on how to report the results of the session back to the larger SIGKM and ICKM communities.

SESSION LEADERS AND SPATIAL ARCHITECTS

Denise Bedford is Adjunct Faculty, Georgetown University's Communication Culture and Technology and Retired Senior Information Officer, World Bank. Dr. Bedford has lectured on the topic of spatial syntax and its relation to knowledge flows and has practical experience applying spatial syntax metrics in three case studies. Denise's research in this area continues to expand beyond traditional corporate and academic environments to include manufacturing, retail and social contexts. Dr. Bedford will prepare the Quick Reference Guide for participants to use in the exercises, and will provide a high level introduction to the work of Hillier.

Jayne Sappington is Assessment and LTMS Research Librarian, Texas Tech University Libraries. Jayne will leverage her knowledge of the field to coach participants in the session. Jayne will facilitate the sharing of observations in the final 30 minutes of the session. As the current Chair of SIGKM, Jayne will also report the results of the session back to the community in the form of a webinar, and gauge the community's interest in adding the topic to the general study of knowledge transfer.

Alexeis Garcia-Perez is Reader, Coventry University's Faculty Research Centre for Business in Society. Dr. Garcia-Perez will leverage his knowledge of the field to coach participants in the session. Alexeis' knowledge of knowledge exchange and flows and his engagement with the knowledge management communities in Europe will inform the discussion. Alexeis will support Denise and Jayne in reporting the results of the session to the knowledge management professionals attending ICKM 2018.

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