Do I know where I am going? And how do I read the directions along the way?

The knowledge pathway in the context of surrounding information and a toolset for effective growth.

Dr Amir Morris  
amorris01@gmail.com  

Dr Susu Nousala  
susu.nousala@econ-km.com

ABSTRACT

This paper utilizes theory from several previous Science that do not exist in a vacuum. It is surrounded by philosophy, theology (although not always popular to recognize today) and art as a beginning. These diverse areas have undergone parallel developments and as they do so the tools and techniques to investigate and explore these areas have also progressed in parallel. Following the movement of the modern western world this paper starts with a broad comparison using science, branches of mathematics, philosophy and art, with additional comparisons with theology.

Knowledge management - an often abused expression - is more than just data collection, information presentation, or simple pathways beyond this. Rather it involves the efficient juxtaposition of background information and the value adding of presentation to enhance explicit understanding in a dynamic manner.

The paper explains the different approaches to knowledge management inherent in each time phase, using concrete examples, and then suggests possible extrapolation of these linear progressions for future knowledge management as well as possible toolsets necessary for future understanding and expansion of the knowledge set.

This paper also goes one step further than normally considered, by investigating approaches to cognition in the data management areas and human cognition requirements and advantages. As society evolves, the requirements for successful presentation of data evolve, and yet the raw data amounts can also be effectively presented in new and more compressed manners. So the total information presented can actually increase exponentially and may become easier to understand.

Finally explicit modern examples are utilised to demonstrate the effect of the altered approaches through the distinct time periods and a simple juxtaposition of the technological tools available in each period are utilised to enhance the data presentations. The end results are considered and the effect that the technology may have made to the recording and use of the data and it's transmission as data, information or knowledge evaluated, and a suggested model for overall efficiency of knowledge management presented in conclusion.

1. Introduction

In English the word “orient” originally meant, “to face east”. The original meaning is recalled in now older use such as “Orientals” to mean Asians, or even the original full description of P&O, “Pacific and Orient” In fact some early maps started off with east being “up”, rather than the “north” of current standard practice. Others, primarily from Moslem cultures saw
south as up, and some had Jerusalem as the centre of the world, primarily for theological reasons.

But this is not the only change that has occurred with maps, the initial combining of disparate maps into Atlases, and their “more modern” offspring, street directories. In fact we are suggesting that the changes that have occurred in the map world are explicit demonstrations of information packaging in both past, present, and future, and they hold promise to demonstrate how to effectively present information to humans for easy absorption and use.

Homer is often presented as a blind minstrel. Yet centuries later his epic song is still “known,” of sorts. While knowledge of the original (which was not actually ever directly recorded, even on paper,) is sketchy, Greek, Latin and English, amongst other versions exist. What Homer does is present, as entertainment, a (questionable) history and allows us to travel with the tale without moving.

Humans have a limited number of inputs, often called senses. The 5 classics are Sight, Feel, Taste, Smell, and Hear. Sometimes “developed” additions are included, such as intuition. Intuition is probably an evolutionary survival adaptation allowing the formation of conclusions from an incomplete data set by triggering “memories” with a bypass of signals through the amygdala (Damasio, 1994)

2. Oral Travel and its successor, travel books
Most of us are familiar with instructions like “travel down beyond the house with the white picket fence and then turn down the 2nd street on the left.” This is the basis of oral travel or instructions, and the precursor to visual maps and travel instructions like maps. We mean precursor in two distinct ways, one is prior to actual maps as a scientific guide, and the other is prior to specific maps as the recordings of travelers have been used to develop specific guides and maps.

Homer’s stories allowed travel through the recipients imagination, as well as presenting details of a world picture and possible routes to specific places – real or imagined.

Benjamin of Todelo (1907,and notes, say 1890) was a major 12th century traveler who was on the road from around 1159 to 1173 C.E. and so approximately 100 years prior to Marco Polo. He was the first European traveler to write about China although there is some doubt if he actually traveled to China or just reported on the travels of others thee.

Benjamin’s work gives us clear demographic detail such as key personalities, community sizes, and skills and economic status of persons and communities he met, as well as secondary reporting of others information (in such a form as to distinguish between original and hearsay information!) (Benjamin of Todelo - notes, say 1890)

Marco Polo spent approximately 24 years traveling to and in Asia and China, and following his return to Venice in 1295, he was captured by Genoan forces and imprisoned. At that time he dictated his story of travels to Rustichello da Pisa, an author of romantic fictions, and Fra Mauro picked up, these details amongst other sources in his significant map of the known world in 1540.

3. Maps
The history of cartography probably is well founded in pre-history as sand/dirt drawings and also cave drawings placing location of objects and places in perspective. (http://www.phil.uni-passau.de/histhw/tutcarto/english/3-0-eng.html, Edney 1998)

Harley and Woodward note “Maps are not natural, self-evident ‘statements of geographical fact produced by neutral technologies’. The hand of the mapmaker is guided by a mind located in
a certain time and place and sharing inevitably the prejudices of his or her surroundings.” (Harley & Woodward 1987)

Edney goes further and suggests that maps not only “…just show the world. They show our conception of what the world ought to be.” (Edney 1998)

Maps are depictions of the earth’s surface scaled and un-scaled with or without a defined projection, limited in content to the extent of technology and the knowledge, wish and, or wants of the cartographer or person or the purpose for which the maps were produced.

Maps are used as tools to convey all sorts of information, the list is endless: political, historical, topographic, ethnic, religious, economic and military to name but a few. Today we often think of maps only as tools for navigating from one point on the world's surface to another. If we stop and look at all the maps that we are bombarded with every day we can see that maps are much more than navigational tools. Advertisers, governments, journalists, academics and everyday people, use them for a myriad of reasons. Maps have a great visual power capable of conveying information with incredible authority whether real or illusionary.

"The medieval world map (Mappae Mundi) conveyed little useful information for the traveler, it wished to convey the beauty and clarity of God’s world, as described in the psalms "Nach Zahl, Gewicht und Maß hast Du alles geschaffen." For this reason Jerusalem is placed in the centre with the rest of the world divided in the continents Asia, Europe and Africa, showing the settling of the world through Noah's sons; Sem, Japhet and Cham. The map embraces the reach of God's work by showing that the graves of the apostles can be found in the farthest corners of the World,” (Frenz, 2002)

Of course maps up to and into the late 15th century were sometimes, like Homer’s records, a record of real and imagined countries and facts. But sometimes the discrepancy between accurate and imagined is not arranged chronologically.

The Fra Mauro map was made around 1450 by the Venetian monk Fra Mauro and his assistant Andrea Bianco, a sailor-cartographer, under a commission by king Afonso V of Portugal. At least significant sections such as Africa and parts of Asia and Japan are recognizable to the modern eye.

Compare this with Vopel’s Terrestrial Globe with Armillary Sphere, of 1543, produced in Cologne Germany. It illustrates terrestrial and celestial globes and armillary spheres were important educational tools for illustrating the Ptolemaic, or earth-centered, cosmic system. The series of eleven interlocking and overlapping brass rings or armilla, some of which are movable, that make up the armillary sphere are adjustable for the seasons and illustrate the circles of the sun, moon, known planets, and important stars. (http://www.1worldglobes.com/History/historyofmaps.htm)

Ironically this was the same year that Copernicus's theory of a heliocentric universe was published, a theory that greatly changed the design of armillary spheres. (http://www.1worldglobes.com/History/historyofmaps.htm)

Other forms of information such as perspective and colour were also developing, although with only a few exceptions, maps were not printed in color until the end of the nineteenth century. The “lines” are those that form the image and are normally black or black-brown. (http://www.phil.uni-passau.de/histhw/tutcarto/english/index-hiwi-karto-en.html)

And perspective and projections were developments from a renaissance world coupled with developments in both geometry and philosophy. A popular start date for the renaissance involves the competition in 1401 between Lorenzo Ghiberti and Filippo
Brunelleschi for the contract to make the Florence Baptistery doors won by Ghiberti.

Of note in this art piece is the development of perspective and elements of implied distance, prerequisites for maps that are trying to impart data about distance and relationships on a single page.

4. Atlases and Street Directories

In 1570 the Antwerp cartographer Abraham Ortelius published the Theatrum Orbis Terrarum, often considered the first modern atlas.

The key elements of this first atlas were the publication of diverse location maps in one publication.

The addition of multiple maps allows comparisons and the building up of detail in layers. It is also important to recognize that Ortelius also included a vast southern continent, ‘Terra Australis Incognita,’ supposedly to counterbalance the known northern hemisphere world. (Notes from the State Library of Victoria, Australia associated with the Theatrum Orbis Terrarum by Abraham Ortel published in 1574 Street Directories were not far away. The earliest reference we have found was to a 1650 publication for the City of Albany, New York, USA, utilizing the research of Prof. Jonathan Pearson, of Union College and including the dates of patents and transfers of city lots. (Munsell, 1871)

In the same year, Henry Robinson produced a directory in London, in this case, a list of names kept in an "office of addresses" available for viewing, presumably on paid subscription. Whilst not a map, it provided detailed background data that in time would become part of the overall street directory. (http://en.wikipedia.org/wiki/Henry_Robinson_(writer))

Over time, although exactly which year and where is questionable, the data was provided graphically – nominally in line drawings using black ink.

5. Layers

In this paper we have made reference to layers several times. Layers are both actual and also conceptual.

Layers allow explicit details to be published having a combined impression and context. We can see geographical information such as streets together with land use information, specialist services, traffic flow and/or direction (such as one way streets or time limited parking zones) and even economic spheres of influence such as “natural shopping zones” for demographic differentiation.

Originally layers were produced using a transparent or semi transparent material such as acetate sheets or tracing paper over a fully opaque back sheet.

Today layers are usually electronic in form, and are seen easily in places such as GPS software or versions such as Google Maps where feature sets can be turned on or off.

It should be noted that layer information can be detailed but often requires context to be easily or fully understandable.

6. The Psychology of cognition

In this paper the term cognition is not used just to mean thinking but rather the process that includes an ontological examination of terms and processes.

Because cognitive science often tries to understand minds in the same way a computer processes inputs through processing and then to
specific outputs we utilize a simplistic but usable model.

The authors also have come into knowledge management from a Engineering and Human Engineering / Ergonomics background and so the when understanding human cognition try and utilize a holistic view drawing on the work of application oriented modeling both within the individual and also within the layered environment between work space and outside world (Leamon, 1980, Wilson and Corlett 1991)

So cognition requires sensors to “read” displays – be they visual, tactile or audible, a processor stage, and an effector stage with potential feedback loops to fine-tune processing and ability to effect specific control.

7. Memory
In humans, different types of memory have different roles. Short term memory is involved with processing and comparison. Miller’s (1956) approaches to 7+/-2 numbers is an example of short term memory

Long term memory is sometimes structured into declarative and implicit classes. Declarative memory is that which is recognized and consciously remembered. Implicit memory is used for priming and is also sometimes called procedural memory as actions and activities cause it recall.

Norman (1988) specifically considers human mapping and activities and concludes that where the design of control systems correlate with the human’s mental model our ease and accuracy of using equipment is enhanced and made more effective.

8. Concrete – abstract continuum
The more concrete a symbol or instruction is the easier to understand and act on. The more abstract the greater the local processing that must be done by the individual.

Symbols may be concrete or abstract. Language too is worthy of consideration here as if the language and connotations of language are understood, then we may fast track to understanding context and means of tacking in information, and also of acting upon such information.

9. Knowledge Skills Rules
Rasmussen (1983,1989) introduces the ideas of Knowledge, Skills and Rules, and that repetition of acts, activities, or even thinking may make a process evolve from requiring active thought to becoming an automatic activity. This may be demonstrated by rote learning of a route to travel or by rote learning of multiplication tables till they become automatic responses.

The familiarity and use of standard technologies, be they maps or computer programs leads to a repetitive speed and enhanced ability to take in information. It must be highlighted that this is not the same as understanding – the repetition increases speed to do not to understand what is going on as sometimes the data intake is more superficial.

10. “Knowledge tools”
Tools are hereby considered as items that enhance our ability to intake information, ensure it is in context, and then potentially ease our ability to act upon such information. They may also minimize repetition without adding significant knowledge or context, and so automate or partially automate our responses to the information.

The use of modern computer programs to place information in a graphical form, and in context of geographical or major numerical factors, such as traffic patterns and activity, alternative route recommendations, and facilities within reach, as well as means of minimizing the need for instruction books (Norman 1988) and allow “the information in the world” to be understood in correct context, is to be desired.
The use of colour and audible tones in a manner consistent with human facilities (be they physical or cultural,) and the use of controls that match human attributes (eg. size of fingers, response times,) increase the usability of knowledge tools, ensuring interaction with the tool is likely to enhance the total experience.

11. Conclusion

Well designed knowledge tools should enhance the total knowledge experience. They need to build upon human attributes, be they physical, cultural or psychological, and they need to ensure knowledge presented is in a context to enhance absorption and to enhance the utilization of this knowledge.

Whilst these ideas seem simple the lack of application is regularly experienced and the use of older tools can be reviewed in light of modern understandings of human interaction in a broader world.

References

Prefrontal cortex: Antonio Damasio, Descartes’ Error, Emotion, Reason and the Human Brain (New York: Grosset/Putman, 1994)

Benjamin of Tudela: “The Itinerary of Benjamin of Tudela”
CRITICAL TEXT, TRANSLATION AND COMMENTARY BY MARCUS NATHAN ADLER, M.A.
1st ed: LONDON 1907 PHILIPP FELDHEIM, NY NY

The Project Gutenberg EBook of The Itinerary of Benjamin of Tudela
by Benjamin of Tudela

Benjamin of Tudela: “The Itinerary of Benjamin of Tudela”
Vol II Notes and Essays
Hakesheth Publishing Co NY NY
(No date, but preface dated December 1840)
(Available in the University of Toronto Library G370B47V.2)

Matthew H. Edney, Maps: Knowledge, Technology, Society, Culture ( University of Southern Maine, Fall 1998


Thomas Frenz, Einführung in die Historischen Hilfswissenschaften, Universität Passau (Wintersemester 2002) as referenced in: http://www.phil.uni-passau.de/histhw/tutcarto/english/2-eng.html
Last accessed: 10 June 2011

http://www.1worldglobes.com/History/historyofmaps.htm
Last accessed: 10 June 2011

http://www.phil.uni-passau.de/histhw/tutcarto/english/index-hiwi-karto-en.html
Last accessed: 10 June 2011

Joel Munsell “Collections on the history of Albany,” 1871 details on google timelines:
http://books.google.com/books?id=ydrgRAAAIAAJ&pg=PR3&sig=b81fhST4ILavF0VDt5YNoR2MKbQ&hl=en
Last accessed: 13 June 2011

Last accessed: 14 June 2011


Miller, G.A. “The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information” originally published in The Psychological Review, 1956, vol. 63, pp. 81-97
Reprinted at: http://cogprints.org/730/1/miller.html
Last accessed 13 June 2011


Rasmussen,J. Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models. IEEE TRANS. SYS. MAN CYBER., 1983

Jens Rasmussen and Kim J. Vicente Coping with human errors through system design: implications for ecological interface design