Dynamic Knowledge Spaces in Dental Medicine

E-LEADER

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~ 1,400 clinic beds, ~ 7,500 employees,
~ 4,000 students of Medicine, ~ 500 students of Dental Medicine,
+ students of Public Health, Biomedicine, … ➔ http://www.mh-hannover.de
The cultural heritage - Libraries of the World

The Great Library of Alexandria, Greece, 295 B.C.

Vaticane, Rome, 4 AD

National Library of Russia, St. Petersburg, 18 AD

Melk, Austria, 18 AD

Library of Congress, Washington, 18 AD

Alexandria, Greece, 2002

Knowing where knowledge has been

Knowing where knowledge is now
„The creation of methods to memorize is a must to handle the knowledge which is propagated in an inflationary way in university libraries“  (Conrad Gesner, 1545)
Paradigm Change: Linear vs. Non-Linear Data Management
How much information?

2000: 532.000.000.000.000.000.000.000.000 Bytes
       (532 Peta Bytes, 1 PB ~125,000 DVD’s)

Transfer of 1 PB from New York to Lulea (Sweden, 9000 km
SPRINT: 12 hrs )

2030:
    1.079.000.000.000.000.000.000.000.000.000 Bytes
    (1.079 Yotta- or 1,079 Quadrillards Bytes = 7,984,000 x Library of Congress)

Source: University of California, 2003
Journal Citation Reports (JCR) in 2007

7.528 Scientific journals

1.397 Section – Clinical Medicine (with an impact factor)

51 Section – Dental Medicine (with an impact factor)
Dental Papers

Source: Medline (PubMed) – Dental Journals
Knowledge Management stands for the entire process of identifying the implicitly and explicitly available knowledge,

- knowledge acquisition,
- knowledge structuring,
- knowledge modelling,
- knowledge preparation,
- dynamic knowledge storage and
- knowledge utilisation.
From the PC to the intelligent Web

1 PB (Petabyte = $10^{15}$ Byte), 1 EB (Exabyte = $10^{18}$ Byte), 1 ZB (Zettabyte = $10^{21}$ Byte), 1 YB (Yottabyte = $10^{24}$ Byte)

Source: University of Berkeley (2003), Radar Networks (2008), Quintessenz (2008)
The cultural heritage "Knowledge" defines itself newly.
Web 3.0 Generation – Semantic Web

Knowledge Space of Semantic Inference for Automatic Annotation and Retrieval of Multimedia Content
Semantic Web

Terms are related to each other to form contexts. This transforms information technology in knowledge technology.
## Semantic relationships

<table>
<thead>
<tr>
<th>Homonyms</th>
<th>Ambiguity without functional relationships for example: (river or money) bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polysems</td>
<td>Ambiguity with functional relationships for example: (dental or architectural) bridge</td>
</tr>
<tr>
<td>Synonyms</td>
<td>Unambiguity with conceptual terms for example: Sinus list and sinus elevation</td>
</tr>
</tbody>
</table>
Simplified overview of the “dentistry” macro domain with subdomains

- Implantology subdomain
- Oral surgery subdomain
- Orthodontics subdomain
- Prosthodontics subdomain
- Periodontology and prevention subdomain
- Oromaxillofacial surgery subdomain
- Pediatric dentistry subdomain
- Endodontics subdomain
- Conservative dentistry subdomain
- Material science and biomaterials subdomain
A thesaurus as a metastructure of domains with ontologically interconnected elements
A thesaurus as a metastructure of domains with ontologically interconnected elements
A thesaurus as a metastructure of domains with ontologically interconnected elements
Mr. Q - your personal Web assistant
The Dental Medicine in the Web 3.0 Generation

The brain of Mr. Q: Networked knowledge spaces of the mental lexicon

Mr. Q - your personal Web assistant
Mr. Q and the Semantic K-Graph

Peri-implantitis is a condition that includes soft tissue inflammation and rapid loss of bone.

- Bone loss
- Periodontitis
- Bone
- Soft tissues
- Teeth
- Implant
- Abutment connection
- Gum
- Peri-implant radiographs
- Prostheses
- Plastic
- Root-form implants
- Cotton ligatures
- Laser
- Abutment
- Laser
- Ligature
- Periapical radiographs
- Probing depth
- Denial implant
- Mucositis
- Trauma
- Bone loss
- Interferon-gamma
- Interleukin-1 beta
- Risk factor
- Cytokines
- Osseointegration
- Modified plaque index
- Modified bleeding index
- Occlusal overload
- Microgap
- Occlusal
- Osseous integration
- Osseous
- Bone
- Soft tissues
- Teeth
- Apex
- CD4 marker
- Oral hygiene
- Implant insertion
- Implant reconstruction
- Implantation
- Oral hygiene
- Plaque control regimen
- Long term prognosis
- Clinical characteristics
- Implant crest
- Gingival crevicular fluid
- Bone
- Symptoms
- Other
- Person Group
- Patient
- Male
- Beagle dogs
- Dog
- Patients
- Physiologic function
- Biochemistry
- Organism
- Research project
- Quintessence publishing & somirne
- Berlin, 23. June 2008
Mr. Q and the Semantic K-Graph
Ontology of Implant Surgery Knowledge Elements

Characteristics:
- static
- dynamic
- EBM
- multifactor
- valences
KM / VL – Structure of Knowledge Space
KM / VL – Structure of Knowledge Space
KM / VL – Exploring Knowledge Space
5 x Q  Exploring Knowledge Space

AVATAR

My name is Mr. Q ...
... your personal assistant for knowledge management.
K-Space DentMed • Visual Library: The Dynamic World of Knowledge in Dental Medicine

- Education Clips
- Courses & Training
- Guidelines
- Case Reports
- Video Clips
- Clinical Documentation
- Restorative Dentistry
- Periodontics
- Implant Dentistry
- Prosthodontics
- Oral Medicine
- Oral Surgery
- Dental Technology
- Orthodontics

Universities and Practice Network of Competence „K-Space Agent“

multilingual

AVATAR
My name is Mr. Q,... your personal assistant for knowledge management.

K-Space Visualization
DentalExplorer in 11 languages

View:
Display of findings with the help of high-resolution digital images of excellent original dental processing.

Planning:
A total of 64 treatments that can be combined freely. Individual processing and storing of alternate plans possible.

Alternative views:
A total of 5,000 photographic images of occlusal-, lateral-, and frontal views.

Video player:
Videos on 28 topics in 11 languages to support patient communication and information.