Modeling Lifelong Learning Networks

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Content

- Background: Learning Networks RTD Programme
- More in detail: Model and Simulation of a LN:

  “Increasing Learner Retention in a Simulated Learning Network using Indirect Social Interaction” (draft article)
Background

- Open University of the Netherlands.
- RTD into learning technologies: Aim: development of new learning technologies to support lifelong learning
- Major outcomes:
  - models and theories
  - specifications of learning technologies
  - prototypes of new technologies
Learning Networks for Lifelong Learning

A learning network is a group of persons who create/perform, share, support and study learning activities and units of learning in a specific knowledge domain.
So, a network in the following sense

A group of persons:

- connected to each other in a **social** sense
- connected to each other in a **technical** sense
- connected to relevant **learning resources**
- connected to each other in order to **learn** from & with each other (also producing new learning resources)

✔ as independent as possible of constraints like: location, institution, job, time, specific technologies

✔ persistent over time to support lifelong learning in a certain field
How to realise Learning Networks for Lifelong Learning?
Several views of a Model of a Learning Network

- Learning Network modelled as a Graph
- Use Case Model
- Architectural Model
A learning network can be represented as a graph of ‘activity nodes’ (runs of units of learning) within some knowledge domain.
LN Graph with a learner track
Patterns of Collective Tracks Emerge
Learner Positions and Objectives
Planned Learner Routes ("curriculum")
What activities do users perform in a Learning Network?

=> Use Case Model
What are the functional components that can be identified in a Learning Network Infrastructure?

=> Architectural Model
Architecture
(see: special issue BJET Technology & Lifelong Learning Nov. 2004)
Three Core Issues in a Learning Network

1. How to **make & use** pedagogical well designed, interoperable and reusable units of learning in the LN?
2. How to **position** learners in a LN?
3. How to help learners to **navigate** in the LN?
ad 1. Make & Use Units of Learning

- **IMS Learning Design** is used to model the units of learning within the LN
- **User-friendly Tools editing, cm, runtime**
- **Quality mechanisms** to support the building and identification of high quality units of learning
- **Community Policies** to stimulate authoring, use and reuse
- ...

Variety of Projects in the Programme (ASA, Alfanet, CopperCore, Unfold, Telcert, Jisc/open framework project)
ad 2. Learner Positioning

- Interoperable, secure ePortfolios
- **Assessment** issues (e.g. of informal required competences)
- **Mapping** of competences of individuals between different, but comparable learning networks
- Formal **accreditation** and examination issues
- **We are looking at**: integrative test framework, renewal, extension of QTI, LSA to support positioning

Projects: testing framework, revision QTI in IMS
ad 3. Now in more detail: How to setup **Navigational** support within a Learning Network
Navigation questions within LNs

• I want to know something more about topic X, is there an adequate unit of learning available?
• What is, for me, the best route to attain a certain learning objective (or certificate, diploma, ...)?
• I have done X and Y, what would you advise me to do next?
• ...

...
Problems with navigation in LN

- In any field per definition a very large number of possible units of learning,
- of a variable quality
- The number of units of learning change rapidly over time
- Nobody has a real overview of actual quality, number of possibilities, ...
So,
How to Organize a Learning Network under such constraints?
Our Approach

- Use of self-organisation principles from complexity theory, specifically principles of indirect social feedback ('stigmergy')
- Use of bio-inspired theories ('pheromones')

The paths of successful predecessors are used for advice
Netlogo Simulation of a LN

- Multi-agent simulation environment for research
- See Draft publication in handouts
Learners + Units of Learning in a LN
Properties
One of the Experiments with the Simulation

- Problem: what is the effect of indirect navigational feedback on study success (number of students that attained objective)?
- $2^4$ factorial design:
  - pheromone strength (0 or 100%)
  - matching error (0 or 100%)
  - disturbance in learner environment (0 or 100%)
  - quality of the unit of learning (0-100% or 100%)
- N=12 replications in every condition
- Every replication runs 260 simulation weeks (5 years). In total 49920 week cycles (runs about 10 hours on fast computer)
Outcome

- All main effects significant + interactions:
  - pher-strength * matching error
  - pher-strength * quality of unit of learning
Interaction Pher * Matching-error
best versus worst case

no matching error, 100% quality and no disturbance (F = 0.7816)

100% matching error, 0% quality and 100% disturbance (F = <.0001)
Outcome

- Overall influence Pheromones: 9% increase in proportion of students who attained their objective
- Matching-errors are compensated by pheromones
- Some quality variance is compensated by pheromones

more details: see paper in current issue of the Journal of Artificial Societies and Social Simulation (JASSS)
Thank You

More info:
www.learningnetworks.org
dspace.ou.nl