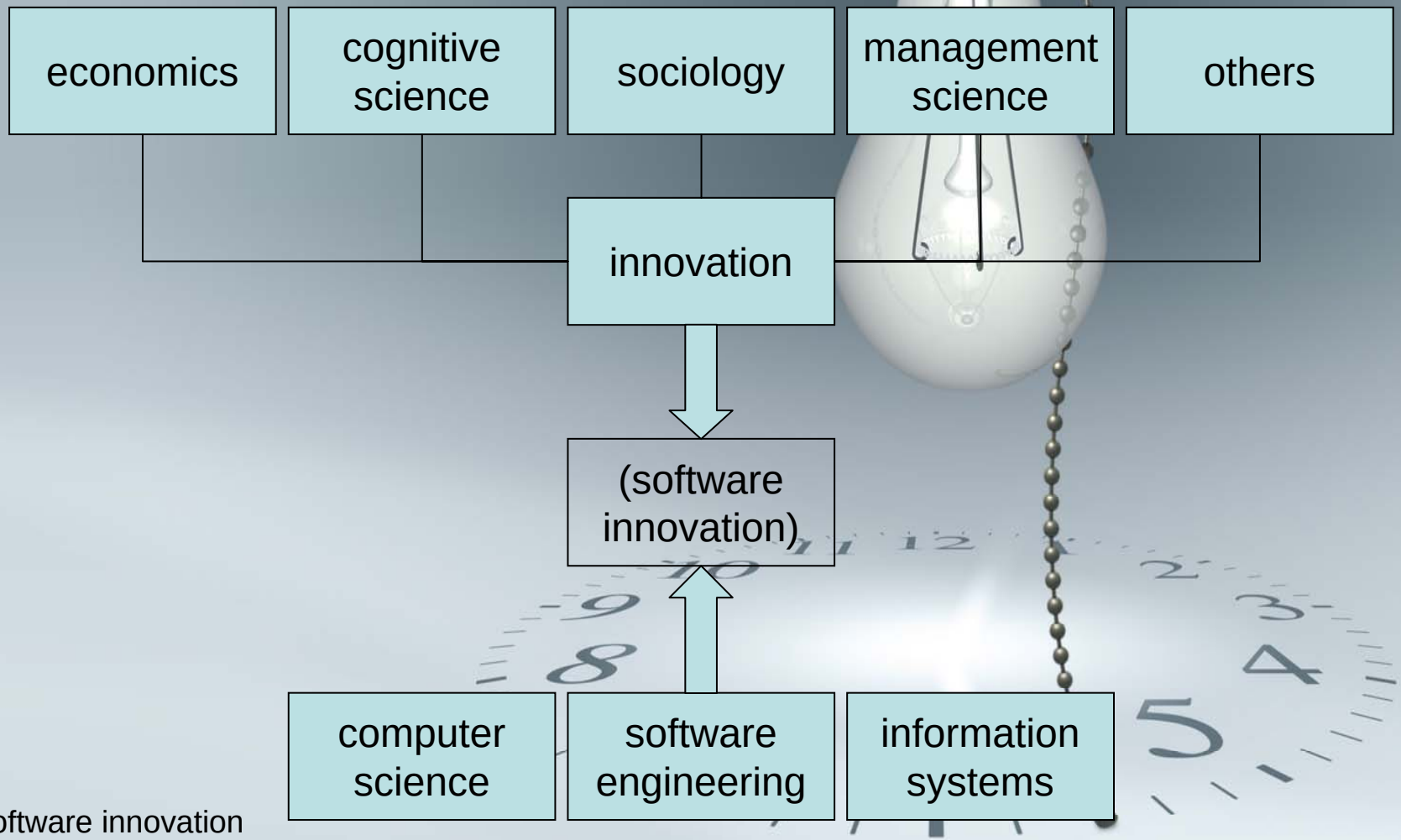
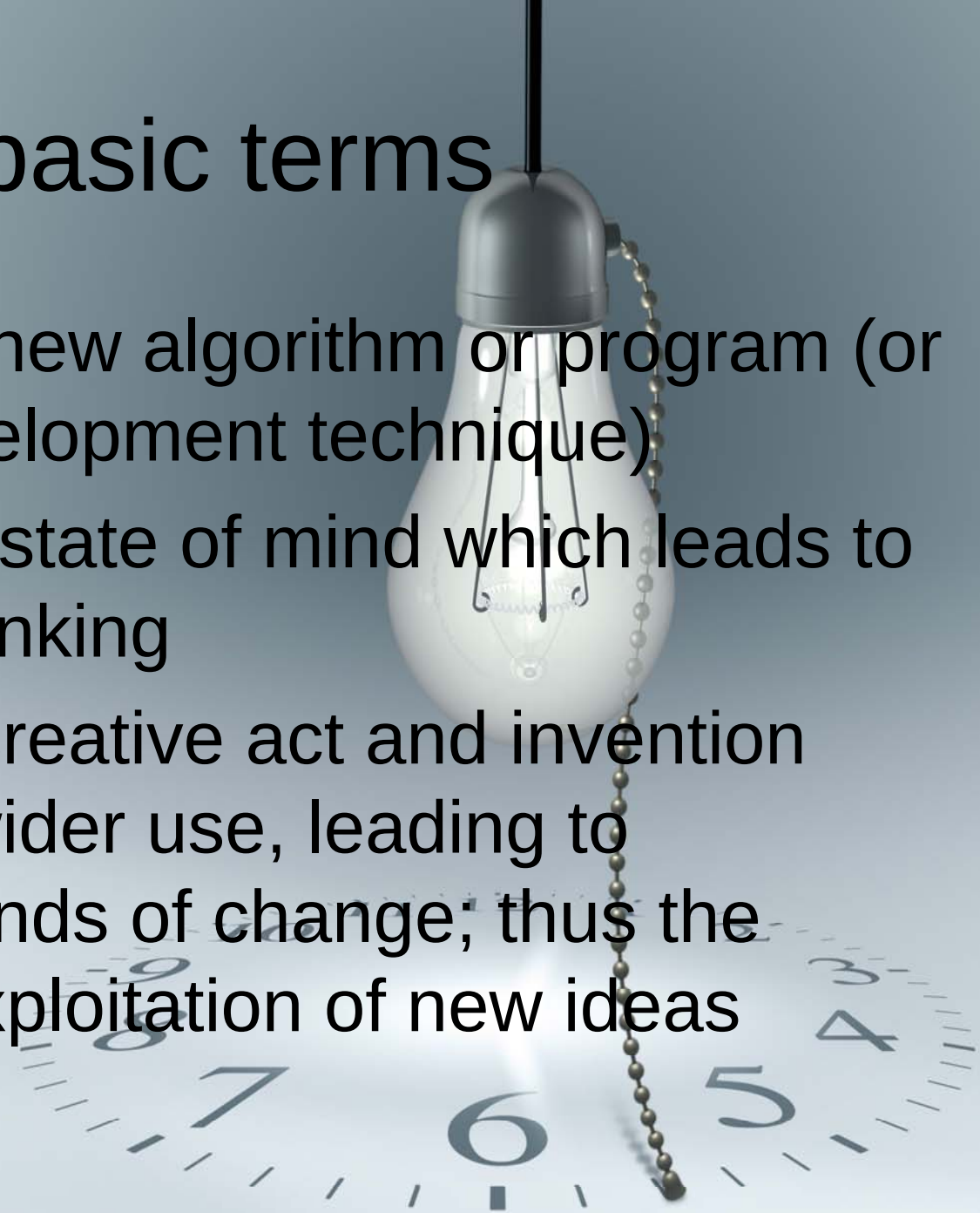
the science of innovation

innovation: scientific disciplines



basic terms

- invention - a new algorithm or program (or software development technique)
- creativity – a state of mind which leads to innovative thinking
- innovation - creative act and invention carried into wider use, leading to substantial kinds of change; thus the successful exploitation of new ideas



(software) innovation overview

- (software) innovation = invention + exploitation + diffusion
- invention: the creative act or process and its result (e.g. a software progam)
- exploitation: commercial development and adaptation to practical situations
- diffusion: adoption by a wider audience

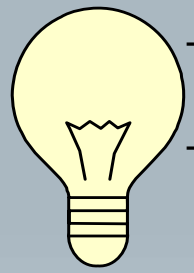
(software) innovation: consequences

- result of software innovation is experienced as change in
  - the way people work
  - the way business is carried out
  - people's choice of entertainment
  - communicate habits and interaction
  - governance of communities
- types of (software) innovation
  - radical (disruptive, discontinuous)
  - Incremental
- resistance
- innovation cycles

(software) innovation: product and process

- (software) product innovation – (the creation of novel and useful software programs)
- (software) process innovation – (the introduction of novel and useful ways of developing software)

(software) innovation models



- The linear (light bulb) model
  - product innovation is understood as a sequence of stages or phases, rather like the waterfall model of software development
  - recognition of an innovation opportunity, idea development, problem solving, prototyping, full-scale commercial development, utilization/diffusion.
- The iterative model
  - process–orientation (reflecting agile system development methods).
  - focused and creative bursts of development activity (for example storming),
  - repetitive but evolving
- The network (or community) model
  - the conjunction of people, ideas and expertise. teams, co-operative work, expertise sharing, timing (in relation to other innovations) and pushing existing boundaries.
  - co-operation and competition
  - Silicon Valley, Linux community

innovative software products

- two characteristics:
  - novelty: they have not been developed previously
  - utility: they have some form of application which users value.
- utility types:
  - software innovations can provide underlying improvements for the delivery of other computing services (operating systems, internet browser)
  - software innovations can provide new, improved, more efficient or cheaper services for communities of users (like the Skype application mentioned earlier).
  - embedded software can enable innovation in other technology products, such as cars and washing machines.
  - innovative software can be an enabler or driver for business change
  - innovative software can change the way people interact and communicate, as for instance with social networking software (Facebook, LinkedIn)
  - innovative software can change entertainment patterns

software process innovation

- the development of new techniques, tools or methods for software development – XP, SCRUM.
- in a more traditional development process - introducing more creative or imaginative techniques or tools to (for example) requirements elicitation.
- user-led: expert users collaborate in the writing of software which meets their own needs (e.g. Linux community).
- market analysis – where the demand for new software products lies
- focus on productive work
  - avoiding thrashing
  - creative tension
  - ‘flow’ - a mental state characterized by high energy and focus

innovative processes and products

- complex relationship between software process innovation and innovative software products
- no particular evidence that innovative software processes necessarily result in innovative software products
- some forms of innovative software products may be best developed using traditional methods.

main sources

- Fagerberg, J., C. Mowery, et al., Eds. (2005). The Oxford Handbook of Innovation. Oxford, Oxford University Press.
- Roberts, E. B. (1988). "Managing invention and innovation." Research Technology Management **31**(1): 11-27.