

Becoming skilled faster

- why we need this
- what we can do today
- research issues

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Why being skilled matters

“Show me a skilled individual, a skilled company, or a skilled country and I will show you an individual, a company or a country that has a chance to be successful. Show me an unskilled individual, company or country and I will show you a failure in the 21st century. In the economy ahead, there is only one source of sustainable competitive advantage - skills. Everything else is available to everyone on a more or less equal access basis.

(**Thurow**, 1994:52, quoted in Keep & Mayhew, 2001, SKOPE, Oxford / Warwick University)

FENIX: Skills needed for today

- *“How you gather, manage, and use information will determine whether you win or lose” – **Bill Gates***
- Managers need to be IT-literate, or they will not benefit from having knowledge workers
 - Knowledge workers must be able to share views on how best to accomplish the tasks facing them – this means allowing them to participate in connected communities

The research agenda

- What is Expected From Universities?
 - Education, Innovation
 - Research (Blue Sky + Applied), Published Output
 - Know-How, Know-What, Technology Transfer
 - Identifying Future Needs of Industry and Society?
- Professor William Keogh, Heriot-Watt University, UK

1925 view (Prosser and Allen, 1925),
<http://www.aged.vt.edu/sae/ppt/theorem.ppt>

- Prosser on becoming skilled:
 - The training environment, processes & performance standards, should be similar / identical to those met in the real occupation. Tasks should be actual jobs and not exercises or pseudo jobs)
 - Trainees should learn to think and move as in the occupation itself

1992 view vs 2001 view:
Bottom-up or Top-down

training

- Traditional approaches to the problem of how to become skilled are based on a “tell, show, try it for yourself” model of training (e.g., Patrick, 1992). It assumes that, in the words of Sun & Merrill (2001), being skilled is the result of “first acquiring generic, verbal, declarative knowledge, then through practice turning that knowledge into specific, usable procedural skill”. But as Prahalad says, “You can’t find a new land with an old map” (quoted in Pulkkinen, 2003).

Top-down is too weak a model

- It is not grounded in theory to the extent we need today.
- It is too slow, expensive and inefficient. It is also arguably increasingly inappropriate for today's performance-driven workplace.
- Contrast with work by Yili Liu, eg http://www-personal.engin.umich.edu/~yililiu/HFES_Typing_2004.pdf

Michigan-style approach

- **MODELING HUMAN TRANSCRIPTION TYPING WITH QUEUING NETWORK-MODEL HUMAN PROCESSOR**
- Typing is one of the basic and prevalent activities in human machine interaction. Previous work could only analyze the typing phenomena along the time dimension; it could not model error and eye movement of typing. A queuing network model of typing successfully modeled not only all the 21 phenomena modeled by TYPIST, but also 13 more, including 5 typing error phenomena, 3 eye movement phenomena and 2 brain imaging phenomena.

Show videos of data capture

Research needs detailed data -

- “MyLifeSkills” is a possible way forward. It makes two key assumptions.
- First, that we can record the observable aspects of how an expert undertakes a task (using processes developed in projects such as Microsoft’s MyLifeBits), then replay that recording in a way that enables someone else to experience performing at that level, with the rapid execution and economy of effort associated with being able to accomplish the task almost without thinking: “Vicarious Expertise”. All members of a community could benefit from skills gained by any member of the community, without first needing to formalise their knowledge (in contrast to e.g., Hakkinen, Jarvela & Dillenbourg, 2000).

Research needs detailed data - 2

- Vicarious Expertise, if coupled with computer-based productivity tools, offers a way to help people who meet a task for the first time, and who do not know how to complete the task, to achieve their immediate goals AS IF they were already expert at the task, then if they wish, to reflect on what they have just managed to do, as part of Continuous Lifelong Learning and of personal development through Appropriation (Polman, 2000).
- A core underlying model is “bottom-up” learning, which according to Sun & Merrill enables people without *a priori* knowledge to construct the explicit declarative knowledge that they need to fully make sense of, and generalise, the skills they acquire.

Outcomes of training: 2 expert stereotypes

- “Adaptive-creative versus routine-reproductive expertise in hypermedia design: an exploratory study”,
- Cognitive Tech Work (2003) 5: 94–106
- C.A. Syer, R. Jad-Moussa, S. Pelletier, B.M. Shore

Adaptive-creative / Routine-reproductive

- “Experts solve problems using a forward strategy, make fewer errors, categorize problems differently, and develop skilled self-regulatory processes such as solution monitoring, allocation of attention, sensitivity to informational feedback.

Adaptive-creative / Routine-reproductive

- Adaptive-creative experts perform skills efficiently, and show an understanding of the nature of the task. For instance, the expert explains why a step works and is necessary, as well as possible variations to the step. These experts are adaptive in the sense that they can modify a procedure according to the constraints, and the amount or kind of material available. They rely on heuristic strategies, for example, seeking a more universal solution beyond the present successful one and by examining the possibility of alternative solutions. They are able to devise new procedures or strategies, and make new predictions.

Adaptive-creative / Routine-reproductive

- Routine-reproductive experts show an absence of deep conceptual understanding, and only generalized consequences of practice, for example, using strategies by which the skill could be performed more efficiently. Furthermore, they rely on a trial-and-error approach, and while they perform a skill rapidly and accurately (as long as the constraints and materials are familiar) they do so without constructing conceptual knowledge. These experts lack flexibility and adaptability to new problems, and use algorithmic strategies that ensure steady and quick solutions.

Types of work and learning

- Link to article by Yrjo Engestrom, U. of Helsinki.
- Picture of historical forms of work

Is Social Justice a Priority?

“At the start of the new century, is it enough to have amassed more knowledge than at any previous time in history, without also giving attention to how that knowledge will be disseminated and used by and for others, particularly by those who have been most excluded...?”.

(**Mary Robinson**, 2000,
quoted by Adrian Hill, tti2004, 29 June 2004)

Thank You