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## Commentary on "Research on Information Systems Development in Scandinavia: Unity in Plurality"

John Leslie King

*University of California, Irvine, JohnLeslieKing@emaladdressnotknown*

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characterization of the different streams of work as summarized in Table 1 is a real contribution, and will surely be required reading for Ph.D. students (especially those in Scandinavia) for many years to come.

As fine as this contribution is, I do have some questions about it. First, did the work of Nygaard and Langefors derive from other sources, perhaps sources outside Scandinavia, or did their ideas spring full-grown from them, like Athena from the brow of Zeus? I do not want to engage in a discussion of "who did what first," but my own reading of the history of digital computing suggests that the programming of computers (from which all computer-based information system development evolved) first arose in centers where the computers themselves were created. Although the Scandinavian countries were early adopters of computer technology in research and application, I do not recall any accounts in which the Scandinavian countries played prominent roles in the invention of early digital computers. Most of that work occurred in the UK and the US, although important contributions were made in some other countries (e.g., from IBM Laboratories in Zurich). Typically, computer programming was very much a co-evolutionary phenomenon that accompanied the emergence of hardware architectures. It was not until the development of early translators in machines such as the EDSAC at the University of Cambridge and the IBM 650 in the United States that hardware-software independence (a critical development in the evolution of information systems) became possible. I have not made a study of the transfer of ideas from the early centers of computer development

to the larger world of information systems, but any intellectual history that traces fundamental concepts such as those of Nygaard and Langefors would benefit from examination of the routes their ideas traveled.

A second question has to do with the imputed comparison between the Scandinavian tradition and that of the United States. Iivari and Lyytinen have described information system development research – more particularly, commentary on the nature of system development processes (or what they should be). They have not said much about information system development practice. This is an important distinction, because, as a general rule, the vast majority of information systems are written by information systems professionals, and not by information systems researchers. I have no evidence to back me up, but I am willing to bet that the actual practices of building information systems are much more similar across national or regional boundaries than are the respective styles of commentary about such practices. This has likely been the case for many years, given the extent to which the world computing industry was dominated by a relatively small set of major industrial firms, and an even smaller set of essential computer and software architectures with which systems could be built. This situation is likely even more extreme today. The penetration of a very few operating systems and key application packages into the world of computer use has almost certainly channeled information system development practice as much as any theories about how it should be done, and perhaps more so. Information systems researchers are within their rights to be proud of their contributions to under-

standing how we might build systems more quickly, effectively, and so on. But this is not the same thing as having a significant influence on how systems are actually built. We might see more variance across national or regional boundaries in the way we talk about information systems development than in the way systems are actually developed.

That raises my third, and final, question. Perhaps the most intriguing part of the Iivari and Lyytinen paper is the far-right column in Table 4. This column registers their assessment of "practical use" for each of the approaches. Aside from "considerable use" of the infological approach in the early 1980's, and "increasing use" of MetaCASE tools, every other approach has had only modest effect on practice. What, exactly, are these approaches attempting to accomplish? If the goal is to have a major effect on the way information systems are developed, the analysis by Iivari and Lyytinen suggests that the enterprise is not going very well. Happily, those of the Scandinavian persuasion need not feel isolated in this regard – one has to look hard to see the practical effects of several decades of software engineering research on actual software development practice in the US. In fairness to Iivari and Lyytinen, their paper is not an apology for information systems development research and its contribution to the world of systems development – they were simply summarizing the Scandinavian tradition in this area. Nevertheless, one cannot help wondering what the goal of research on information system development would be, if not to affect information system development practice.

Fortunately, we need not assume that the only role of information systems re-

searchers, and even those who are interested in information systems development, is constrained to changing the way system development occurs. As much as anything else, research into information systems development is a means of studying human behavior in the development of technology. With a few exceptions, no other species on Earth except humans use tools. Certainly, no other species use tools like computers. Technology is a central feature of contemporary human existence, and humans are engaged in an ongoing program of capacity development and capacity exploitation when it comes to technology. The comments above notwithstanding, it is perfectly sensible to assume that research into how we build artifacts will eventually affect how we actually do build them. In fact, given the rapid pace of change in technological capacity, and the comparatively slower pace of change in our understanding of complementary factors such as human and organizational behavior, it is unlikely that actual practice in building systems could change as quickly as our studies of the process suggest it should. To my thinking, the Scandinavian tradition in information systems development research is less a tradition of concern about how to build information systems than it is an ongoing quest for meaning in the activity of building such systems. If this is correct, then the judgment of modest effects of the various approaches on "practical use" is probably accurate for the moment, but premature over the long run.