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Published: 01/01/1996

Document Version
Publisher’s PDF, also known as Version of Record (includes final page, issue and volume numbers)

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Citation for published version (APA):

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Information Technology and
Its Possible Contribution to Prolonged
Independence and a comfortable Old Age

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Paper presented at the HUSITA 4 Conference
Rovaniemi, Finland, 11-14 June 1996
At the end of 1995 some 20,000 American senior citizens were surfing on Internet. Of course this is only about 1% of the American elderly, but it clearly indicates that information technology (IT) also starts to get some meaning for senior citizens.

Ways to contribute

There are at least five ways in which IT can contribute to comfort, pleasure and independence in old age (Bouma & Graafmans, 1992). These ways are:

* Prevention of unnecessary age related changes. Many "problems" of old age are modifiable through long-range, nonmedical interventions involving nutrition, physical activity, exposure to chronically dangerous environmental conditions such as auditory noise, changes in lifestyle regarding alcohol and tobacco consumption, etc. How can IT address prevention? Using physical activity as an example, technology for monitoring ambulatory levels of activity in everyday situations, and the design of exercise and recreational equipment that is fun to use, i.e., has a high positive motivational quality, and the design of ambulatory monitoring or warning equipment for improper posture for specific tasks such as lifting and general posture to prevent or slow the development of e.g. kyphosis.

* Enhancement of until-now-untapped resources and capacities in the elderly. Ageing brings with it challenges. It also brings opportunities in the form of time for new social interactions and activities, time for new learning and leisure activities. There has been virtually no attention paid to this aspect of aging by IT. The exception is the design of adaptable housing to suit the differing needs of people during the life cycle of the family. The potential uses of technology for enhancement of activities is particularly intriguing. Can IT contribute to enhancement? One
potential area is in user-friendly technology in communication to facilitate remote contacts with family and friends, to make new contacts and to participate in educational activities remotely. Another area is in the development of user-friendly systems for games, artistic and creative activities and learning through multimedia technology.

* Compensation for lost or decreased capacities. The vast bulk of existing IT applications efforts in aging and for the handicapped focuses on this issue. Examples include special user interfaces, monitoring and guidance systems, passive and active alarm systems. The big question that remains to be answered is whether these applications will be restricted to the public care market or whether there will be a private consumer market as well.

* Aid to formal and informal careproviders. One of the most significant recent developments in home based medical care is the widespread use of complicated medical equipment by family and other nonprofessional caregivers, e.g., respirators, intravenous injection devices, monitoring equipment, etc. Many of the developments designed to help individuals remember medication regimens currently undergoing ergonomic analyses would be of equal use to caregivers. Another, almost trivial, contribution of IT is to the optimization of the care providing processes and the organizations responsible for these.

* Support to research on ageing processes. The contribution of IT applications to research on ageing and the aged is indirect. It is a truism that technology is revolutionizing the scientific study of physiology, psychology and biology, and this is equally true for observational and interventive studies of aging. The impact is enormous both on data currently collected and in the reanalysis of archival information. An example is the study of differences in the dynamics of the strength training in young and old persons. Another example was the use of electronic scanning devices that allowed twenty-eight years of historical data on pulmonary function to be digitalized and reanalyzed.

A systems approach

Can this Utopia be realised by IT applications alone? The answer must be negative. IT is just a means to an end. If we do not adopt a holistic, ecologically valid, systems approach to create a functional and sustainable environment for our elderly fellow citizens as well as for those who are in need for some form of support, the solutions provided will be suboptimal and not acceptable.
This systems approach is well developed in human factors research.

Smith (1990) identified two broad models that have guided human factors and ergonomics thinking with respect to ageing. The first, articulated by Faletti (1984) focuses on physical and psychological decline with aging; the decline is seen as a person-environment problem. The role of human factors is to improve the match between human capabilities and demands of the environments—to optimize the fit between the human operator and the equipment or environment in which the person functions. As human capabilities with respect to sensory, cognitive and mobility functions decline, tasks and environments of the person are adjusted to enable the person to continue functioning.

The second, articulated by Fozard and Popkin (1978) and Fozard (1981) emphasizes the developmental aspects of aging. Smith (1990) summarized their main ideas: 'the ideal approach to design for the elderly would (a) accommodate aspects of constancy and growth as well as decline; (b) be sensitive to social and psychological needs as well as performance needs; (c) because both people and environments change, acknowledge the temporary nature of generalizations about aging.' Training, needs assessments and counselling are additional useful methods of study and intervention to task the task analytic approach used by Faletti.

Both of these views share the central philosophy of human factors—a systems approach toward ageing. The philosophy is well articulated by L.E. Morehouse (1958): "The ultimate aim of each human factors effort is toward the optimal utilization of human and machine capabilities to achieve the highest degree of effectiveness of the total system." The implication of this philosophy for human factors practice as well as research and ageing is that ageing itself cannot be defined independently of the environment—age grading of human abilities and functioning only has meaning in reference to environmental challenges and supports. It is largely for this reason that the report on Human Factors for an Aging Population (1990) identified as research priority the need for "good distributional data on tasks, problems and abilities and to perform detailed task analysis where the benefit is likely to be the greatest."

A third approach to the choice of research which encompasses the two just mentioned is based on a combination of the developmental approach to human factors and ergonomics activities and the criteria for "optimal performance engineering" proposed by Donald L. Fisher (1993). The centrepiece of both ideas is that the ideal human factors research activities and the reporting of
research results would be in terms of performance of an "optimal system." This 'back to basics' concept is at the core of human factors theory as defined by Morehouse in 1958. In it, the mix of human and machine functions that yields optimal system performance is identified in such a way that rules are generated which predict how assignments of function to man and machine should change as system requirements change or in the case of aging what combination of mechanical and human components, if any, will yield equivalent system performance given a nonremedial age related change in the capacity of the human.

Dilemmas

Work and employment are by no means the most important dimensions of a broader social vision of the IS. Any such vision has to take account of the major possibilities for improving the quality of life and social cohesion through creative approaches to ICTs. However, equally there are concerns that the IS could lose its sociability. The culture of screen and chair could lead towards isolation, with people increasingly interacting through the digital media and withdrawing from the social realm.

* A wide diversity of different ways of interacting is desirable so that people have an real choice between interacting on-line and interacting with humans. The IS offers new opportunities for social integration, through building up communities at a local level. The introduction of ICT's will permit more people to work from, or near, home for at least some of the time, meaning that more localities might come alive during the working day. With ICTs, more services, especially education and community services, can be delivered into communities at a local level. Such changes could help to reinvigorate whole communities and lead to stronger social networks and a sense of place.

* ICTs could help to overcome some of the disadvantages associated with mobility problems or a lack of access. Indeed the opportunities associated with the IS to increase the quality of life of disadvantaged groups are already provoking great excitement and attention. Steps should now be taken to shift from speculation to concrete action.

* The introduction of ICTs could introduce new risks of social exclusion for some groups and exacerbate the risks faced by other groups who are already disadvantaged. People who are not in the workforce or education are less likely to encounter these new technologies, and so may be
left behind as the new technologies become more widespread. The people at risk of being left out, because they are not in work include those have retired early, those taking career breaks to raise children and unemployed people. People with low incomes, including many elderly people, single parents and, again, the unemployed, face particular dangers that they will lack access to the IS, because household budget will probably not be adequate. The nature of exclusion in the IS needs close scrutiny so that policies can be constructed to avoid the development of a two-tier IS.

* In policy terms, it is important to recognize the need to adapt the IS to the needs of people, and not just to expect people to adapt to the IS. Although there are clear barriers of technical literacy facing most people, it seems pertinent to ask whether the current user-friendly technologies cannot be made a lot more friendly to use through more ergonomic hardware and software.

* There is a fear that the IS could be an isolated society, with human contact increasingly replaced by telepresence and electronic communication. However, the reality seems to be more complex. Leading examples where the automation of services has taken place, such as in retail banking, seem to result in a reduction of routine human transactions but an increase in more complex interactions, such as giving advice, consultation and negotiation. These changes are not yet well understood, nor do we know what can be done to make the new systems of social interaction more convivial.

* The family has an important role as a place where people will be socialised into the IS and as a learning environment. Ways in which families can fulfil these roles more effectively are needed, such as closer integration between learning at home and learning at school and support for parents in understanding the new ICTs, allowing them to learn along with their children.

* The social consequences of the rapid introduction of new ICTs are not well understood. Although the more dramatic scenarios of fragmentation and isolation associated with a cybersociety seem simplistic and overstated, there are concerns that the abstract nature of interacting through screens could lead to an abstraction of reality. A particular issue is the stress associated with information and perceptual overload. The sheer volume and immediacy of information raises fears that people are no longer in control and need new techniques and strategies to help them cope. In addition, these technologies extend people's availability, so that they are on-line and on-call wherever they are and at all times. Such accessibility could easily become invasive, and its effects on social life need to be better understood.
* New forms of marketing, retailing and consumption are emerging along with the IS. In the past, most retail services were local and available for a few hours of the day. In recent years a widening of the availability of these services has occurred in most places. With ICTs, it is possible to by goods and do business, on-line, at any time and in any place. These changes will affect the way we consume, our understanding of the process of consumption, the relationships between buyer and seller and the place of shopping in our culture. They need to be tracked to enhance the ability of consumers to use the new technologies and services to their own advantage.

I hope that the presentations during this seminar will show us the possible contributions to a comfortable life for the elderly and that the discussions will take into account the dilemmas mentioned before.

References