

## Chapter 14

# TUM–AgeTech: A New Framework for Pervasive Medical Devices

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### **ABSTRACT**

*In this chapter, the program of the Technical University Munich regarding implementation of technologies for an aging society is introduced. Various departments from the faculties of both technology and medicine are working jointly to actualize a technological basis for the development of assistance devices. Industrialized countries such as Japan and Germany will be facing an extreme demographic shift over the next 15 years. More than half of the population will be over 50 years of age. Belief in technological progress – initiated by the innovations of computer and the Internet – harbors the risk that the time required for necessary technological advancements is being significantly underestimated. This chapter describes the motivation and the concept of hardware architecture for implementation of assistance devices and for integration of pre-existing (or concurrently developed) sensors and concepts.*

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## INTRODUCTION

### Demographic Change

#### Aging

Aging of the population and its respective challenges are impacting numerous industrialized countries, Japan and Germany in particular. In Germany, for example, the rate of aging for the society, according to the Federal Statistical Office, will achieve its most extreme velocity over the next few decades. They have attributed the reasons for this to the so-called “second demographic transition”. This is characterized by a considerable decline in the birthrate in the years from 1965 and 1975, which came after the high-birthrate years of the 50s and 60s (baby-boom generation), which led to the emergence of a demographic wave in age distribution (Figure 1).

#### Time Line

The demographic wave in age distribution will manifest itself, over time, in an ever-increasing average age. In the year 2030, when the baby-boom-generation reaches retirement age, society’s aging process will have reached the highest level. The old-age dependency rate (the ratio between individuals of an employable age and those of retirement age) at this time will be 100:50. This is in contrast to the current 100:33. Every third individual will be 65 years old or older (Figure 2).

Even if the rate of birth and/or the rate of immigration were to immediately and drastically increase, this process could no longer be avoided today (Dorbritz et al., 2008b; Radermacher, 2007).

#### Costs

In light of the proportion of individuals needing care (care quota), we can anticipate, for an aging

society, an increase in the costs for such care. This care quota indicates what percentage of individuals in an age group is in need of care. It rises with an increase in age; for example, 82% of those in need of care in Germany in 2005 were 65 years old or older (Figure 3).

Based on the projected development of the population and the current care quota, one has to expect an increase of 37% in the number of individuals in need of care by the year 2020 and of 58% by the year 2030 (Dorbritz et al., 2008a).

Alone due to the registration of admissions into nursing home lists for services covered by care insurance (the German equivalent of Medicare nursing-care insurance, “Pflegeversicherung”), their respective expenditures grew by 16% from 1997 to 2003. This amounted to EUR 17.5 billion in 2003. Full-care in a residential facility, at 47%, represented the most significant item of expenditure from this total (Lange & Ziese, 2006).

#### Productivity

From an economic point of view for the employable population, potential losses accompanied by work incapacity, disability and early death are not taken into consideration for the directly-assessed costs of illness. A feature of these losses is irretrievable years of employment, which amounted to 4.2 million in 2004. In comparison to 2002, this corresponded to a decline of 296000, which is principally attributed to a decline in injuries and poisonings, the most common cause for irretrievable years of employment. The second-most common cause for irretrievable years of employment is to be found in mental and behavioral disorders such as depression and schizophrenia, which increased by 13.7% in comparison to 2002. Back disorders also play a significant role, in that they result in half of the irretrievable years of employment caused by impairments to muscles, bones and/or connective tissue (Böhm et al., 2006).

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