

Discussion on the Research and Development Mode of Intelligent Products for the Elderly Based on the Fusion of Industry and Education

Taking Gerontechnology Research Center of Yuan Ze University as an Example*

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Abstract—Taking Gerontechnology Research Center of Yuan Ze University as an example, this paper discusses its research and development mode of intelligent products for the elderly based on the fusion of industry and education, using methods of field research, interview and qualitative analysis. The results show: the mode based on the fusion of industry and education can make their respective advantages on design research, concept exploring, appearance modeling, core technology R&D, product transforming and business access, etc. Intelligent products for the elderly, aiming to elevate their quality of life (QOL), are accepted and developed better among relatively healthy elderly users. In order to realize “pro industry”, application-oriented university should deeply plough and carefully manage on elevating training objective for student, course setting, changing of teaching mode, prior to carry and try of project cooperation, which require joint efforts of school, teachers and enterprises.

Keywords—fusion of industry and education; intelligent products for the elderly; research and development mode

I. INTRODUCTION

The rapid aging of population structure brings unprecedented challenges to society. With the development of science and technology, intelligent products aimed at improving the life quality of the elderly users have emerged at the right moment and developed rapidly. For application-oriented university, keen smell the industry prospect, take the initiative to close to the demand of industrial development,

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using their own discipline superiority and innovation, cooperate, as well as a place in the industry development, to lead the industry, but also can promote the transformation of students training mode and ascend, truly achieve "fusion of industry and education" and "pro industry".

From Nov. 19th, 2018 to Dec. 15th, 2018, the author participated in the 8th college science and technology training class of Xiamen University of Technology, which was organized by Fujian provincial department of education to jointly train teachers from Fujian and Taiwan. During the exchange study in Yuan Ze University, the author was deeply impressed by its Gerontechnology Research Center (hereinafter referred to as the "center"). Because the research on the design of elderly intelligent clothing and apparel products is just one of the research fields of the author, a multi-dimensional in-depth understanding and communication was made. The practice of the center in the research and development of intelligent products for the elderly, platform operation, enterprise docking, teaching mode transformation and student training is quite successful, which has a high reference value and is of great inspiration and help to the author's own research, teaching, industry-teaching fusion exploration.

II. RELATED THEORETICAL KNOWLEDGE

A. Aging of Population

Internationally, some western developed countries believe that the elderly are people over 65 years old. In China, according to the law of the People's Republic of China on the protection of the elderly, citizens over 60 years of age are elderly.

The United Nations international population institute stipulates that the criteria for a country or region to enter the aging age are: the proportion of the population aged 65 and above exceeds 7% or the proportion of the population aged 60 and above exceeds 10%.

Official data from the ministry of civil affairs show that by the end of 2015, the number of elderly people aged over 60 had reached 222 million, accounting for 16.1%. There are 143 million people over 65 years old, accounting for 10.5%[1]. According to Fujian statistical yearbook 2017, in 2016, the proportion of the elderly population over 60 years old in our province was 13.73%[2], which showed an increasing trend year by year compared with the data of the sixth population census in 2010 (11.42%).

At the end of 2017, the proportion of people over 65 years old in Taiwan reached 13.86%, and facing the double impact of aging and fewer children, the aging index reached 105.7% in 2017, the total number of elderly population has exceeded the total number of young population[3].

As can be seen from the above definitions and data, both Fujian and Taiwan have entered the aging process.

In many advanced countries, various problems caused by aging population have emerged, including economic problems such as reduced productivity, higher medical and care costs, and social welfare problems such as elderly care and social security. In addition, the social participation, leisure and lifelong learning needs of the elderly should also be paid attention to.

B. Intelligent Products for the Elderly

Faced with the challenge of aging population structure, in response to the gradually matured background of technology such as wearable device, humanoid robot, internet of things, 4G / 5G broadband communications, artificial intelligence technology in recent years, aging user oriented intelligent products (including intelligent clothing and accessories products, smart home, intelligent health care auxiliary equipment, etc.), systems, services, and even the living environment, can provide children, family members and professional medical staff convenient and efficient care tools at the same time, improve the elderly life quality, reduce the burden of caregivers, and drive the development of relevant industries, which have good prospects for the future development.

C. Industry-education Fusion and Application-oriented University

The essence of the fusion of industry and education is the fusion of production and education training. Teaching is conducted in the production environment and production is conducted in the teaching process. Production and teaching are inseparable and integrated [4]. As the main body of regional knowledge accumulation, creation and dissemination, application-oriented universities are important carriers and platforms for original innovation, technology transfer and achievement transformation, and the fusion of industry and education has become an important way for

colleges and universities to develop themselves and serve the development of economy[5]. Industry-education fusion in application-oriented university includes four modes: industry-education fusion research and development, co-construction of industry-education fusion, project traction, talent training and exchange[6].

III. RESEARCH AND DEVELOPMENT (R&D) MODE OF INTELLIGENT PRODUCTS FOR THE ELDERLY

A. Brief Introduction of the Research Center

Established in January 2003, Gerontechnology Research Center (GRC), located in Building 3 of Yuan Ze University, is one of the first academic institutions in Taiwan to engage in the field of geriatric science and technology. The center has 14 full-time staff and 10 interdisciplinary students, with Professor Yehliang Hsu of the department of mechanical engineering as the director and professor Chorkheng Lim of the department of art and design as the deputy director. With the help of the project — value innovation of production, study and research of Taiwan "ministry of economic affairs", the center established an innovative companies — SEDA GTech in April 2016, which takes "intelligent life/ Internet/ elderly welfare science and technology" as the core, and turn research and development achievements over the years into a series of "genius home" intelligent life products, thus onto the road of entrepreneurship from the university.

The research center has four functional aspects: commercialization of research and development achievements, cooperation between industry and learning, cross-disciplinary talent cultivation, and international academic exchanges. The funding required is self-sustaining and runs toward a corporate profit center, with annual research projects in excess of NT\$3 million. At present, the research and development products of the center include: Internet of things bedchamber for the elderly — instant event warning (M2M communication), Activity-perceptive matters WhizPAD, Activity-perceptive ground mat WhizCarpet, Two-way interactive call bell WhizTouch, indoor positioning for the elderly WhizConnect, cognitive training for the elderly and standard testing game WhizToys (prevention of Alzheimer's disease), etc.

B. R&D Mode

1) *R&D foundational support level*: The foundational support level of R&D includes hardware and software. The hardware (site, equipment, etc.) mainly relies on the existing teaching practice resources of the school in the early stage, and is acquired by the cooperative enterprises and the center in the later stage. The software mainly relies on the school teaching innovation and the center research team construction. The former is embodied in the student-oriented talent cultivation framework, such as the all-disciplinary coverage of computer programming and application, independent interdisciplinary elective courses, and the promotion of courses of creative thinking, maker practice and entrepreneurship practice. The latter is

embodied in that the center open related courses to all the students of the university, which taught mostly by enterprise mentors. All of its supporting courses are opened in two semester course, including Introduction to Gerontology, Human Factor Engineering design method and practice, art and design creation, patent analysis, geometry models and computer graphics, mechanical design (1), innovative product design, bachelor's thesis; Mechanical design (2), automatic mechanical design, innovative product development practice, optimal design, introduction to Gerontechnology, Gerontechnology, special lectures on Gerontechnology industry, special program of Italian design summer school, etc. The operation mode of software foundation support in the above two aspects can effectively break down the disciplinary barriers and facilitate the contact and mutual selection between the center and potential research team members, so as to establish a relatively stable research team with fresh blood.

2) *R&D hard core level*: The core links of elderly intelligent product research and development include design research, creative proposal, product design (appearance,

function, material, etc.), technology research and development and implementation, prototyping, and product transformation. In the process of communicating with Professor Yehliang Hsu, director of the research center, he mentioned that the research and development of colleges and universities are mostly in the stage of design or prototype, and it is a very long step to transform them into products and commodities. At present, the implementation of this step and the subsequent commodity distribution and sales channels of the center are completed by its cooperative enterprises (SEDA).

3) *R&D extension level*: The extension level of R&D includes: professional image building — writing a book to become an "expert" in the field; patent applications — add weight to conversations with industry; professional speaking — persuades others and yourself; establish influence on the Internet and issue professional journals; become a "network teacher"; participate in international academic organizations, etc.

The R&D mode of intelligent products for the elderly covering the above three levels is shown in "Fig. 1".

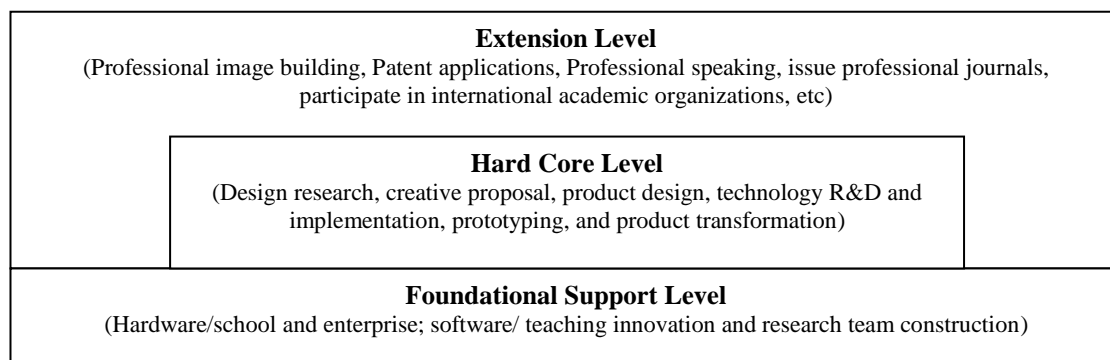


Fig. 1. R&D mode of Intelligent products for the elderly.

4) *Organization division and integration based on the fusion of industry and education*: In the whole industry-education fusion organization, each unit and its specific function are as follows:

- Research center, responsible for "technology R&D, talent training".

- SEDA GTech (the company established by the research center), responsible for product development.
- SEDA (one of the cooperative enterprises of the research center), responsible for hardware production.

The division, operation and integration of the organization are shown in "Fig. 2".

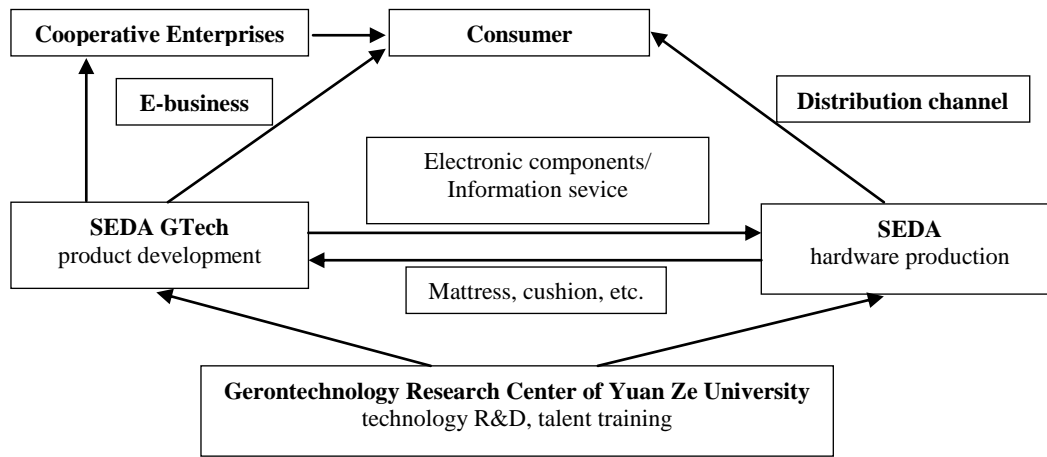


Fig. 2. The division, operation and integration of the organization based on the fusion of industry and education.

IV. THOUGHT AND ENLIGHTENMENT

By discussing the intelligent product R&D mode of Gerontechnology research center of Yuan Ze University, the following reflections and inspirations can be obtained:

In order to let "Fusion of industry and education" really root and deeply develop in application-oriented universities, at the beginning, it is better to choose one or several bases rather than the whole departments and departments. This is conducive to the "small and refined" project prior to carry and try, the formation of a model for reference. Gerontechnology research center is a pilot of the fusion of industry and education in Yuan Ze University.

"Fusion of industry and education " is not only parallel cooperation of universities and industry, needs the school break the inherent barriers in the aspect of curriculum setting and personnel training, such as professional limitation, disciplinary boundaries, and cross domain can't register, set up some more general, cultivation of ability within the scope of the whole school programs, projects, in favor of coming up to the industry which often require interdisciplinary talents. Performed very well in this respect, the practice of Yuan Ze University has two aspects, on the one hand, is the development of innovative teaching modes, mini course (knowledge, practices, visit), practical teaching (creating course, Capstone, project production), digital teaching (flip classroom, MOCs), the design thinking training, issues oriented (solve real issues), PBL (group practice, problem oriented, etc.); On the other hand, education innovation in general education — Chinese (Chinese reform in freshman year, focusing on narrative expression), foreign language (multilingual course), programming language (compulsory program language course for every student, intensive digital application course), self-study ability (independent study course, classic 50, innovative practice course), etc.

From the R&D of elderly intelligent products to the falling to the ground and true walking into the life of the elderly, there is no academic units or research center can independently, needs collaborative, for start-up phase of the school team, the role of the team must be diversified, three-

dimensional, also need each of these teachers and researchers to rethink the positioning.

The intelligent product development oriented to the elderly must carry out the principle of "focus on the needs of users", deeply understand, observe, experience, interview the elderly themselves and relevant groups, start from the point of attachment point, line even face, not only do a single product research and development, but do more reality, do have a sense of humanistic care, do 'warm' design research.

V. CONCLUSION

There is a huge space for the industry of intelligent products for the elderly. It is a subject which need multi-dimensional exploration that how researchers in universities play a role in this space. It is feasible that giving full play to professional advantages, gathering young innovative forces, making solid research, overcoming technical difficulties, expanding cooperation with enterprises, and taking the road of fusion of industry and education.

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