1. INTRODUCTION

The paper is a continuation of presenting the course and results of the research project completed within the framework of classes run at the Faculty of Architecture, Silesian University of Technology. The topic of the project was: senior homes of the future. The first part of the paper was focused on research activities that were the theoretical foundations of the conceptual work, i.e.: substantiation of the choice of the research topic, state of research, objectives, modern trends and requirements concerning the design of environments for seniors and in situ analyses at seniors’ care facilities with the participation of students. In part II research procedures of Design Thinking (acronym: DT) are discussed [3].

2. WORK WITH STUDENTS ON THE GROUNDS OF DESIGN THINKING METHOD

The Project involved 30 fourth-year students (8th semester) of BSc Engineering courses, divided into three teams (10 students in each team). The work commenced with organizational activities, i.e.: the
appointment of team leaders, who were “spontaneously” chosen (they expressed a wish to be leaders or were selected by their teams). In the future, for similar projects a cooperation with psychologists is recommended, to appoint suitable leaders and compile different personalities in each team.

In the next step, the students were given a general description of the problem to be solved: “Our society is ageing, but we do not know how future seniors will function (in 30-40, 50 years’ time), what their needs will be, how they will live and spend time. This issue we address to young people who in thirty years’ time will enter the age of seniority. To facilitate the identification of the needs, we narrow down the topic to a definite professional group – architects and specify the place of their occupancy – senior home”.

2.1. Definition of the problem to be solved

The task set for the students divided into teams was to define the problem in the form of one sentence. However, this turned out to be more difficult than expected. The following proposals were put forward:

• How to provide appropriate conditions and place for dignified ageing, working and resting to architects at the age of seniority?
• How to fulfill the functional needs of the place of occupancy for architects at the age of seniority?
• How to provide and furnish a comfortable, flexible and activating place of living to architects at the age of seniority?

The main difficulty was the ambiguity and imprecision of some wordings. Finally, after negotiations, the following question was formed: “How to fulfill in the future – thanks to architectural solutions- behavioral and functional needs of architects-seniors by the design of the place of occupancy for dignified ageing and continuation of professional activity? It should be clarified that the behavioral needs are, among others: safety, aesthetics, privacy, territoriality, way-finding (inside the building and in open space, proper information signs), sense of satisfaction from living in the care facility [4].

The next task given to the students was to prepare the characteristics of a fictitious person – a model “architect-senior of the future” (in 30, 40 and 50 years’ time), i.e. the person for whom the design project is to be elaborated by the teams. The students, directed by their team leaders, determined different features of this fabricated architect-senior of the future, compiling them in a table and referring to the needs concerning architectural space. The assumption was that the architect-senior is somebody who represented the features and needs of the students’ generation, as well as their subjective image of their own old age. The substantive back-up for the characteristics were numerous articles about specific features of the Y and Z generation available on the Internet (this topic was comprehensively discussed in natemat.pl service, and most of the articles were derived from this website: [6], [7], [8], [9]. According to these sources, the features of the 20-30 years’ old generation are: creativity, wish for prestige and development, appreciation of free time and devoting it to follow and develop personal hobbies and interests, social life and meetings with the nearest and dearest, ability of functioning in the virtual world, treating life as a game (gamification), not using the libraries and printed press (they are boring), no handwriting, maintaining contacts by means of various, especially mobile tools at different times and places, activity in the net, pro-social behaviour (willingness to work as volunteers), openness to the world, travelling, friendship or acquaintance with people representing different cultures.

In view of ergonomics, attention was given to forecasting the so-called “e-illnesses” resulting from the use of new technologies and permanent staying “online”. The following ailments are predicted: problems with concentration, personality disorders, obsessions, sleep disorders due to increased level of melatonin caused by contact with lighted tablets and laptops, intensified syndromes of chronic strain of muscles and tendons – RSI (Repetitive Strain Injury) [10].

This stage was completed by the characteristics of the fictitious architect- senior of the future and the projection of their features, as represented by one of the exemplary info-graphs (Fig. 1).

Figure 1.
Info-graph: characteristics of the fictitious architect-senior (authors – leader: Magdalena Brzuska, team: Agnieszka Cielnińska, Piotr Krawczyk, Wojciech Lesiak, Aleksandra Hojnacka, Marcin Domurad, Anna Kmieć, Sebastian Dziedzic, Paulina Majtyka)
2.2. Work of the interdisciplinary team

Similarly to previous experience from classes based on Design Thinking method [5] – this stage involved the technique of a didactic game, in the course of which the students impersonated the roles of representatives of different participants of the design process, design implementation, and use of the occupancy space for architects-seniors of the future. The objective was to make the list of the needs of different users of such space, and, first and foremost, considering conflicting interests of stakeholders. The defined needs were next translated into architectural space in relation to the building, its surroundings and the flats as such. At this stage, the monographs written by Maria Bielak [1] [2] were very useful, in which the needs of present seniors and other users of their environment were clearly defined, and categorized into quality groups typical for POE analyses, and, in the next step, converted to design guidelines. It should be explained that POE – Post Occupancy Evaluation – is one of the research methods used, as the name itself suggests, to assess buildings after their commissioning to operation and during their use or occupancy. The method entails quality analyses in five quality categories: technical, functional, behavioural, organizational, and economic.

The students, in the form of the tables, described the needs of the main user, i.e. architect-senior, as well as other users, including: medical personnel (physicians, psychologist, nurses, nurses’ aids), assistant personnel (receptionists, cleaners, kitchen and laundry services, suppliers of services and merchandise), administration, visitors (family, friends and acquaintances, volunteers, other inmates, clerics), facility managers, other visitors. The students attempted to translate these needs into the architectural space of senior homes of the future. In their description, however, this space was approached in a traditional, modern way, without innovative ideas, i.e. ideas which could change the functionality of buildings and people in future. To entice creativity, in the next step of Design Thinking (DT), brainstorming was used.

2.3. Brainstorming

This stage, on principle, should be devoted to free formulation of ideas, at first without any limitations and verifications (Fig. 2, 3). In the course of the brainstorming session, the expected innovative concepts appeared, many of which were labeled as “system”:

- intelligent system of the observation (monitoring) seniors’ health condition,
- wardrobe with a laundry and ironing system and stylization depending on the weather,
- system of changing the interiors arrangement depending on seniors’ mood,
- system of diminishing obstacles- doorsteps and furniture with motion sensors, self-closing cupboards and drawers,
- computerized laundry, clearing and registration systems,
- electronic shopping system, in case of increased concentration of pollutants,
- system of shopping delivery by means of air tubes,
- system of filtering air pollution in case of increased concentration,
- intelligent house system – control of mobile devices, for example: remote turning on of the coffee machine or bath filling before returning home,
- system of catering plants and self-cultivating vegetables in case of absence of inmates,
- system of automatic moving around the facility.

The following technical amenities were proposed:

- flat in the form of a capsule supplied by solar power and extending from the building depending on sunlight,
- mini-power plants, trolleys generating energy,
- cleaning robot,
- massaging armchairs adjustable to spinal cord defects,
- intelligent, mobile furniture,
- anoraks assisting movement,
- runways for cars driving on magnetic tracks,
- transportation – flying balloon,
- absence of physical objects (wardrobes, toys) in favor of the integration of technology with the surroundings, holographic images,
- novel food production – hydroponic farms,
- motivating robot – voice system monitoring the daily plan of activities and reminding about training, work, getting up, and motivating to action,
- cash-card machine,
- anti-intruder system – scanner of friends and relatives to prevent the entrance of strangers.

Likewise, a vision of medical services was provided:

- robotic physicians or robots controlled by physicians,
- scanning of seniors for medical diagnosis (with or without the participation of physicians),
• absence of physicians in favor of SKYPE with hospitals.

The student also indicated the necessity of continuous education of seniors, to prevent them from technological exclusion. Their opinions on the manners of communication were very important, for example:

• invisible technology will lead to its close connection with the reality, disappearance of boundaries between the virtual and real world,
• people will spend more time together, but direct contacts will be rather virtual than real,
• communication – instead of telephones there will be holograms, conference rooms with interactive walls,
• technology will occupy less space, images will be reflected on eye retina.

In the course of discussions students also tried to create the vision of the world in 30-40, and 50 years’ time. The majority of the opinions predicted the return of people to nature, but with the use of modern technologies. Fears of the financial standing in the future were also expressed (supported by analyzes rendered by public opinions and the Press), therefore, ecological solutions were proposed, as they would substantially reduce the cost of living of the elderly, or even generate possible incomes. Seniors were imagined as working on ecological farms located around the facility, where they could cultivate healthy food for themselves, as well as for sale. Unconventional energy sources will be commonly exploited, which may be additional sources of income, because thanks to proper design of facilities equipped with photo-voltaic cells, seniors may generate and sell surpluses of power. Ecological trends in the design of care facilities for less affluent seniors are already noticeable, for example [10]:

• Armstrong Place Seniors’ Estate, San Francisco, California, USA, designed by David Baker & Partners, 2011, which received the LEED Gold Certificate. The facility is equipped with photo-voltaic cells and the inhabitants are encouraged to pro-ecological activities, for example: resigning from the use of private cars in favor of vehicles for rent. By reducing the number of cars, the parking lot was used for shops and service outlets.

• Care Facility for Seniors in Zamora, Spain, designed by CSO Arquitectura, 2005 – environmentally friendly building, with a green roof, equipped with solar panels and windows arranged in the way maximizing the utilization of sunlight.

It is possible that the above mentioned solutions will inspire the design of senior homes of the future.

After the stage of coming up with different ideas, they were verified in accordance with the main criterion which was innovativeness and possibility of prototyping.

2.4. Prototyping

Due to time and technical limitations (availability of equipment and materials), the students chose the prototyping methods that were feasible:

• creation of the space of seniors’ rooms with the use of the equipment from the Didactic Room and objects that the students brought to the classes, and, in the next step, role-playing and recording scenes, including the scenario of senior’s day, on
the students’ smart phones (Fig. 4),
• collage method for the creation of inspiration board (mood board) (Fig. 5),
• gluing together the working models (mock-ups) of architectural and urban planning solutions (Fig. 6).

3. Recapitulation and conclusions

On the bases of the collected information, students’ projects and discussions during the classes, guidelines for the design of senior homes of the future were formulated – in congruence with the concepts devised by the students who participated in the classes. The majority of the guidelines are not entirely innovative and are still grounded in the present, but some human needs seem to be consistent, and it is only the way of their fulfilment that keeps changing, together with the tools available at given times. Among the constant, currently relevant guidelines, the following should be mentioned:

Guidelines for the surroundings of senior homes:
• Situation of the site in a safe and quiet place, in the neighborhood of facilities that do not contribute to environmental nuisance (safe surroundings), in the vicinity of green areas; elimination of oppressive factors at the site: isolation from busy streets and noise sources; protection from excess sunlight;
• Accessibility and high quality of space, functional and aesthetic site management, small architecture;
• Safety at the site and in the building, fencing of the site and its monitoring, provision of maximal safety at the parallel minimal isolation (control of the...
entrance to the building, automatic control and registration of persons passing through the entrance), integration with other social groups – to avoid ghettos;
• The building and its surroundings must comply with the binding standards and building law provisions;
• Complete absence of architectural barriers and adjustments for the disabled.
The guidelines concerning the structure, technical furnishings and materials:
• Economical and flexible structures (skeleton structures are preferable) that enable the introduction of changes in spatial arrangements, reconstructions, adjustment of space to changing needs;
• Use of healthy, natural, non-toxic and safe materials, easy to maintain in the state of cleanness and recyclable,
• Furnishing buildings with the installations that give the opportunity of adjusting the micro-climate to individual needs;
• Consistence of technical solutions with the binding standards and building law provisions.
The guidelines concerning the functions in the interiors:
• Flexible spaces, easy to change in view of different arrangements, designed and furnished ergonomically;
• Number, type and size of room calculated on the bases of functional programs, in consideration of the needs of all users (including the disabled seniors);
• Support of maximally possible independence of seniors.
The guidelines on architectural forms:
• Breaking stereotypes, abandonment of “hospital-like” architecture of care facilities;
• Proposal of explicit, modern forms, meeting the needs of more demanding seniors of the future;
• Materials and color-line solutions enhancing positive mood (serenity, optimism), securing the sense of safety and good orientation in the building and its surroundings;
• People-friendly scale, coziness, intimacy – but modernity rather than folksiness;
• Environmentally friendly image, green roof, green walls, integration with nature, absence of barriers between the building and its surroundings, contact with nature thanks to glazed walls or facades;
• Possibility of spending time outside of the building: garden, terraces, balconies, usable green roof with plants;
• Arrangement of windows that maximizes the use of sunlight and a view on the surroundings.
More innovative solutions proposed by the students involved:
• Reduced number of service staff, use of more intelligent systems (thus, fewer number of personnel, some groups of users may be accessible only virtually, for example: physicians, which translates into the quantity and furnishings of zones and rooms), innovative, modern ways of monitoring health, non-invasive monitoring methods, independent / remote notification of physicians, individual warning systems, personalization of solutions (because we are important), dignified everyday life secured by technical amenities;
• Strong need of contact with nature and maintenance of physical activity, more sports, a park or garden surrounding the building, presence of domestic and wild animals, possibility of cultivation with the use of modern technologies (vertical farming, hydroponics, aeroponics);
• Social integration: teams integrating the elderly with young people, “seniors for youngsters, youngsters for seniors”);
• Economic self-sufficiency: renewable energy sources integrated with architecture and the surroundings – energy self-sufficiency, farms – cultivation of vegetables for seniors’ own needs and for sale (self-sufficiency in terms of food, ecology, contact with people, closeness to nature);
• Resigning from the use of private cars in favour of vehicles for rent, bicycle traffic, parking lot for vehicles powered by renewable energy sources, bicycle shelters;
• Design consistent with the principles of certification (nowadays: LEED, BREAM).
According to the students, the built environment defined in the manner described above may constitute a “real home” for architects-seniors of the future. There is a strong probability that such environment may satisfy not only physical needs of seniors in the future, but will also exert a positive influence on their mental, emotional and spiritual condition.
It should be noted that the method of DT has been useful in stimulating collective creativity of students’ teams. Especially brainstorming and prototyping
were interesting for students and resulted in new ideas. It seems that this way of conducting classes is worthy of continuation.

REFERENCES


