Evolution of Domestic Kitchen

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Abstract. Domestic kitchen area is the most important, most intensely used functional area in the apartment. With regard to laboratory nature of kitchen works, equipment and users of different age and physical fitness, kitchen is a potentially dangerous place. From the beginning of its existence kitchen has influenced family integration and socialization processes. For centuries the kitchen area has been changing its equipment, shape and location with regard to other rooms in a home. The appearance of ergonomics and anthropometry sciences made it possible to do a research, in order to simplify kitchen work. American housewives initiated an improvement of the kitchen area. The technical progress enabled an infiltration of functional areas, an integration of equipment functions and their grouping, which is seen in models of the open kitchen and the island-shaped kitchen. The evolution of domestic kitchen is a constant process, and because of that fact, it needs to be ergonomically analyzed. It is necessary to take into consideration the ergonomic criteria of both planning and correcting the existing kitchen solutions. Ergonomic education of statistic user contributes to the reduction of accidents and the facilitation of kitchen work.

Keywords: domestic kitchen, technical progress, ergonomics, socialization.

1 Introduction

Domestic kitchen area is the most important, most intensely used functional area in apartment. It's not only a place of food preparation and consuming, but also a place of household members spending time together, tightening the family bounds and developing the social connections. Some house works which are not connected with the kitchen work take place there. Regardless of size, functional type and layout, the kitchen is a multifunctional area. Domestic kitchen is no longer strictly the domain of housewives – thanks to the changing lifestyle, men cook or help in kitchen work more often and more willingly nowadays. Inviting guests into the kitchen area is synonymous with inviting them into the center of family life. The equipment in an open kitchen is exposed and kitchen works are no longer hidden, just the opposite, guests and the rest of family members participate in those works more and more often. The way of domestic kitchen usage confirms its multifunctional nature and emphasizes its necessity in the apartment structure. The usage of a kitchen is connected with health

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hazard. Food preparation process has a laboratory nature and the kitchen resembles a certain laboratory, where some more or less complex activities help compose ready to serve meals. The kitchen and lab analogy is more visible through its specific equipment, like a stove or an oven that generates high temperatures, sharp utensils, kitchenware, electric kitchen appliances, household detergents and the neighborhood of water and the electric current. It is easy to have an accident in the domestic kitchen with a health hazard. Falls are included in the most common threats, not connected with the kitchen equipment, e.g. as a result of slipping on water spilt on the floor. Threats associated with using the kitchen may have effects delayed in the time, e.g. food products and kitchen waste in combination with dampness and warmth, create a favorable environment for harmful pathogenic micro-organisms to multiply. Both, fit people and the disabled, older people, crippled people or moving on wheelchairs as well as children are users of the kitchen. Especially the disabled and old people need more communication-motor space, and equipment located on an appropriate height. If that is not fulfilled, the risk of accidents is grows significantly. The presence of children in the kitchen requires additional precautionary measures and securities, as well as the supervision of adults. The common lack of an optimal connection between the kitchen area and the rest of functional areas in an apartment, makes it difficult to communicate and causes collisions. The earliest experience in contacts with other people takes place in the family house. The family is the smallest social group, within which the first relations are being built between household members. The milieu, an appearance and a spatial-functional arrangement of an apartment, can influence the intensity of these relations. Domestic kitchen is one of the fundamental areas, which affect the socialization process. In houses, where the kitchen area is not only a workplace, but also a space of being together, a very important task is social integration, and deepening relationships with family members and friends. Children watched by the mother, grandmother or the rest of family members, may participate in small kitchen works, learn or play, and by that, acquire the ability of peaceful coexistence in the community. The rapid pace of life, the career, the education or extracurricular activities more and more often cause the lack of the time for spending time together with the family. Therefore, the process of preparing meals and eating them more and more often become the only moment, when the family can talk, discuss family affairs or simply be together. Common family contacts are an inherent element of the family life, and they have a big influence on human psychophysical comfort, especially for children (education, upbringing process) and for older people (the feeling belonging, being needed etc.). Domestic kitchen is a special area in an apartment – on the one hand it is this so-called heart of the house and center of the family life, often called the hearth, on the other hand it is a place potentially dangerous, which is what the users and designers often forget about.

2 Shaping of Domestic Kitchen – From Prehistory to Present Time

Food preparing area goes hand in hand with mankind, from the moment people started to use fire. Before people started to settle, they would gather with family members around the bonfire finding warmth, safety and thermally treated food. The prehistoric (period from the beginning of the history to about 3500 BC) kitchen area

was the immediate surroundings of the bonfire. The originally nomadic lifestyle soon turned into settled, the kitchen area became the hearth. It was the only element of permanent equipment [1]. The conversion of primary bonfire into the form of the centrally situated hearth was the first step for establishing the functional layout of the homestead, in which the food preparing area constitutes the superior role. The period called Antiquity (from 3500 BC to 5th century) initiated the division and zoning of the homestead, in which the location of kitchen area was conditioned mainly by the social status of the householder. The possibility of having slaves resulted in the isolation of the kitchen area from the formal part of household. Modest homesteads continued the model of a centrally located hearth. A stove made of sundried bricks was elementary permanent equipment. A specialization of the kitchen equipment took place, and the grade was dependant on the wealth and financial possibilities of the user. The outside stoves didn't require ventilation systems. Ventilation was held in closed compartments through door openings, comparatively through the hole in the roof, or more rarely through a window opening [2].

Medieval kitchen area (period from 5th century to 15th century) in its early stage was located in the central point of a homestead [3]. The multifunctional nature of that area was characteristic particularly in climatically cooler regions of Europe. Urban housing development initiated the division of homestead into individual functional areas, and once again in history, the material status and exploiting servants for kitchen works, have separated the kitchen from the rest of the rooms. Other matters which caused resignation from the central location of the kitchen area was among others a fire hazard, problems with carrying out smoke and implementing additional sources of heating [4]. The change of kitchen area location did not reduce its importance, which was emphasized by the variety of equipment, work place organization and specialization of kitchen tools, like the rotational spit, pots, and grilling tools [5]. A hearth or an open fireplace was a basic component of permanent equipment in a medieval kitchen area. Inside cottages of poor people it was usually a hearth or a huge clay stove, at first without the exhaust system [6]. The ventilation was held in rich houses and castles, through window openings, hoods, sometimes through the roof holes, or rarely by the doors. The hood, which enabled to carry out smoke outside the building by the chimney-pot, was a novelty [7].

The so called modern era is a historical period initiated by the age of the Renaissance (15th century) and spanned to 19th century. The appearance and equipment of contemporary kitchen was conditioned, above all, by the material status of the owner. The migration of the rural population into cities caused the growth of service employed as servants, and that fact caused the tendency of separating the workplace like kitchen area from other rooms. A diffusion of ventilation by hood and chimney, and stoves providing the usage of new kind of fuel – hard and brown coal, made it possible to locate kitchens in any place in a household layout [26]. The kitchen areas moved away from the residential areas into the basements of houses (England), to the backyards with separate entries (France), or into the separate buildings next to houses (Poland) [8]. The different attitude to domestic kitchen area was observed in Dutch homesteads, where a very few, or none of servants, shared the work with a housewife, and the decoration and kitchen equipment confirmed its leading meaning in the house structure. The integrating function of kitchen area was kept in the countryside, where the stove often took up the entire corner of the only chamber [9].

The rise of the contemporary model of kitchen area (so-called present times: period from 19th century up to first half of 20th century) initiated the development of technological progress known as Industrial Revolution. An intensive expansion of factories caused the depopulation of villages, people's migration to cities, and the formation of working-class' housing estates [10]. Still, a contrast was noticeable between the kitchen area in rich residences, kitchens in homesteads of the country poor and flats of the new municipal working class. A kitchen development as an interior took place, and kitchen area gained attributes of today's kitchen. The growth of kitchen ranges contributed to more kitchen improvements. The research on more spectacular, and more economical usage of current fuel, like wood and fresh released on the market coal, grounded the construction of easy to use closed cast-iron stoves, with the possibility of temperature adjustment and reduced dimensions [11, 12]. The next step forward was an introduction of new sources of the thermal energy: the fuel oil, gas and the electricity. Stoves of those types gradually entered into households [1, 13]. The reduction of servants in American houses forced the carrying out of duties on housewives. That inclined searching for new concepts of residential interiors, particularly the laborious kitchen area. Permanent kitchen equipment has changed, organizing the order of carrying out successive meal preparation stages.

Enforcement of food pasteurization methods, next to accessibility of frozen food, revolutionized the previous way of meal preparing [14, 15]. Appearance of new materials, appliances made of stainless steel or aluminum, and household detergents, contributed considerable improvement of hygiene in kitchen area [12]. Water supply systems, gas piping and wiring systems, appeared in large numbers in cities [16]. Gradual reduction of kitchen area space was caused by the expansion and variety of kitchen equipment, fittings and wiring presence, reduction of servants and housewives employment. Thanks to numerous kitchen improvements, women did not have to spend nearly all day in the kitchen. Increased housing demand for the working class was solved through the development of multi-family residential buildings, and by so-called Frankfurt Kitchen - work kitchen designed like a laboratory [17].

The birth of prefabrication took place in early period of 20th century in United States. In many countries of Europe, including Poland, the prefabrication was popularized after the World War II, when housing demands in destroyed European cities were filled up with blocks of flats [18]. Regardless of apartment size, the small work kitchen was isolated from other functional areas. Beginning in the second half of 20th century, the model of laboratory kitchen became a standard [19]. The isolation of a housewife during kitchen works met with criticism, what later lead to changes in the functional layout of new and renovated apartments. The open kitchen, partly or entirely connected with a living room, appeared soon in. Entering of more and more excellent materials and modern forms of design influenced further functional changes in the kitchen. The kitchen regained its meaning as the multifunctional center of the apartment, gathering household members like a prehistoric hearth.

3 The Domestic Kitchen Rationalization

From the beginning of civilization people tried to make improvements in their surroundings by applying primitive - at first - inventions, like simple forms of tools and

furnishing. All improvements of kitchen area, which took place from the beginning of humankind to crucial 20th century, confirmed the existence of the so-called intuitive ergonomics – also called the unconscious ergonomics. It was a way of shaping the tools or residential area, in order to adapt them to dimensions of human body or other special needs [20]. An evolution of thermal processing area illustrated the example of such action, like raising and encasing the hearth, so that there was no need to bend over it, then a medieval rotational spit made for more efficient and more comfortable grilling, and finally stoves with the heating plate from 18th-century, which eliminated the need of suspending pots above the fire [21].

The 19th-century North America was a cradle of efficient and functionally designed kitchen. With Industrial Revolution, a rapid development of industry and mass production took place. That released the need of bringing up issues associated with adapting the omnipresent machine to dimensions of the human body and initiated such studies like ergonomics, anthropology and anthropometry [22]. Research on work organization, the functionality of devices at workstation, and appliances level of adaptation to the employees, was commenced. The scientific methods of work organization were used for the first time in the United States [23].

The forerunners of the introduction work organization rules to the domestic area, were the most familiar with kitchen work housewives. The need of self-sufficiency on many levels of everyday life, caused by lack of housemaids, initiated deliberations about housework rationalization in kitchen area. The purpose was to make it possible to perform all housework by one person – a housewife. In 1841 Catherine E. Beecher wrote "A treatise on Domestic Economy for the Use of Young Ladies and at School", where she precisely described the appearance of a kitchen, determined accurate location of kitchen range and sink, and suggested a lot of practical conveniences. In 1869 Mrs. Beecher and her sister Harriet published "The American Woman's Home", in which they promoted reduction of house space to minimum, in order to spend less time for clearing it up.

Christine Frederick in 1912 wrote the article about improvements: "The New Housekeeping: How it Helps the Woman Who Does her Own Work", in which she defined the adequate height of worktops to eliminate the need to bend down, usage of drain boards and driers next to sinks in order to eliminate the need of wiping the dishes, and rational kitchen tools location. She was also an author of so-called household without housemaids. In 1923 Mrs. Frederick wrote "Household engineering: scientific management in the home", in which she reduced the kitchen works to two essential procedures: preparing and cleaning [24].

Margarete Schütte-Lihotzky was an author of the laboratory kitchen. In 1926 the laboratory kitchen was used in about ten thousand social flats in Frankfurt. From that time it was called the Frankfurt kitchen, and this model of kitchen area became a standard in social flats until the end of 20th century. The simplified model of laboratory kitchen was equipped with indispensable devices and utensils, and provided comfortable work in spite of small work space. It was a standard solution in multi-family prefabricated residential buildings, of which the full bloom in Poland fell in 1970s [21]. While using them, it turned out, that the model of the closed work kitchen was not an optimal resolution because of limited space and separation of functional area, however the carried out research and the improvements notably simplified the kitchen works by sequencing the kitchen technology.

4 Contemporary Model of Multifunctional Kitchen: The Open Kitchen and the Kitchen Island

Domestic kitchen has changed during the last thirty years – it has evolved to the most important functionally area in apartment. The attitude to kitchen works has changed relatively lately, but its role in tightening the family and social bounds was noticed long time ago. The conception to join the small closed kitchen with the daily area was presented at first in single-family housing in the USA. In 1934, a house plan, designed for Malcolm Willey by Frank Lloyd Wright, had the kitchen partly open into a living room. Although the kitchen area was called the work room, it was connected with the social area, divided only by furniture. The idea was to merge the cooking, dining and home entertainment areas in order to encourage the husband and children to participate in kitchen works [25]. Of course, it was working on relations between family members. On the contrary, in common block of flats, the small isolated kitchen was a dominant till almost late 80s of 20th century. Functional changes in the kitchen area in apartments' were initiated by unsatisfied users – housewives enclosed in small kitchens, suffering from psychological and social discomfort. In Europe, those changes took place later in relation to the North America, where as early as in 1960s a window located between the closed kitchen and living room, or the dining room, was used to serve meals, and to take back the dirty plates. This connection paved the way for walls elimination between those rooms, and it contributed to the introduction of models of the so-called open kitchen afterwards [26]. The multifunctional kitchen area, often opened and connected with a living room, was no longer a neglected, hidden part of the flat.

The appliance, changed by the influence of technological progress, which enabled the introduction of the open kitchen, was the kitchen electric hood. Keeping away from the rest of apartment all unwanted smells, accompanying the cooking process, was one of the reasons to close the kitchen. Inside the above-mentioned Malcolm Willey house, the kitchen was well aired by windows and chimney hood, and that enabled opening the kitchen area [25]. Most flats had no such conveniences and possibilities. The electric hood made it possible to remove unwanted kitchen smells, and by this, encouraged to open the kitchen area in each type of apartment.

Effective ventilation systems and high-tech ventilation hoods have been improved, and they can work efficiently in the close circulation system - there is already no need to connect the kitchen ventilation hood to a flue [27]. That allows a free location, e.g. on the ceiling or on the furniture equipment near the cooker. The example of advanced equipment is "De Dietrich" hood, which is mobile, and can be slipped into a worktop after the cooking process [28]. A hood can be equipped with an intelligent system – thanks to the CSI technology it turns on when the sensor detects any smell. Some of models have other features, which simplify work, like height regulating systems [29]. The ventilation hoods take visually interesting forms; they can be equipped with additional functions, like lighting points. Although lighting points mounted into a hood became a standard, there are some other additional functions of the kitchen hood. Few years ago "Siemens Media Hood" appeared - a hood with a 17" LCD screen, CD and DVD, and with the Internet connection. That kind of hood is not only kitchen equipment, it connects the kitchen to the outside world [30].

The manufacturers are trying to get ahead of each other in selling competitive solutions for kitchen devices. A universal computerization of kitchen equipment is taking place. There is a possibility to control the electric kitchen equipment from a distance by the Internet. Some devices, like hoods and fridges ("Screenfridge" by Electrolux), provide a possibility of watching TV and surfing on the websites [31].

The kitchen furniture is no longer associated with the kitchen, and more frequently with the living room. The kitchen evolved to the rank of the kitchen room. Kitchen rooms are equipped with representative furniture, merged into furniture of the living room, and the only thing indicating that it is a food preparing area, is the presence of kitchen accessories, like the sink or the heating top. An attractive design is characteristic for kitchen equipment details, and because of that fact, they are exposed more willingly. The technological progress causes the disappearance of visual borders between the working and relaxation area. The contemporary kitchen equipment is more and more frequently designed by well-known designers, and it becomes recognizable. One of the most recognizable kitchen tools, available in most schops, is a citrus squeezer "Juicy Salif" by Philippe Starck, designed for Alessi [32]. Other example of well known futuristic kitchen equipment is "Z.Island by DuPoint" – the kitchen designed by Zaha Hadid [33].

There is also a great choice of technically advanced equipment, and everybody can choose an optimal solution. That kind of a kitchen model encourages the users to spend time on cooking with the family or friends - kitchen works become a pleasure, nearly a relaxation. It is possible to apply the model of the open kitchen both in bigger flats and houses, and in cramped flats with existing closed kitchen. Limited space of the kitchen, connected with the daily area, causes an optical enlargement and improves the apartment quality.

A so-called kitchen island is a common element of open kitchen furniture. The location of the kitchen island on the border of kitchen and living room, and divides those two areas and simultaneously joins the space of work and rest. The kitchen island means detaching some elements of furniture and equipment from the walls, and situating them in central location of kitchen area. It is possible to locate a worktop, a cooker, an oven, cupboards and a sink on it. Elastic wirings enable to apply these all elements of kitchen equipment and furniture, and it induces increasing of work space on the kitchen island.

The kitchen island can be applied in all types of kitchen interiors. The kitchen island is most suitable for bigger rooms, but even in relatively small kitchen it is possible to use it. Small modular kitchen island, designed by Kristin Laass and Norman Ebert, can be folded after cooking, and at its most minimalistic dimensions it only uses one square meter of space. The "Small Kitchen" contains everything needed to prepare meals: a sink, a cooker, an oven, a refrigerator, kitchen cupboards with kitchenware and all necessary utensils [34].

Central position of the kitchen island generates proper accessibility, improves it, and makes kitchen works more attractive. The kitchen island can combine individual functions, and become a main work space. An example of efficient kitchen island includes a sink, an electric or induction cooker, and storage cupboards or shelves. Such elements as cookers, kitchen sinks, countertops of diversified height, create comfortable conditions for all kitchen works. The kitchen island can be connected with the living room or can be a room - a change in previous kitchen equipment

installation, so far usually placed by the wall, is characteristic for both models of the kitchen island. This transformation improves the communication between functional areas, and by exposition of equipment, which previously was seen as unworthy to expose, raises the rank of the kitchen. There is a very wide range of diverse designs of the kitchen island, determined by required features. The kitchen island is an attractive solution, which assures very good conditions of performing all kitchen works, and supports the tightening of family bounds. Devices and furniture of the kitchen island often takes over the majority of functions required, including the function of accessories and food storage. The shelves on the kitchen island can be opened, in order to simplify location of tools and kitchen utensils, but in most cases the island looks like a representative furniture, without possibility to see what it contains. The storage space is usually located under the worktop, but can be placed above it, within comfortable reach.

More and more often kitchen islands are designed as an independent center of food preparation, especially the thermal processing. The eventual storage area is located separately, by the wall. Progress in the field of kitchen equipment manifests itself among others through its mobility, and the kitchen island is perfect for that. There is no need to keep close to service riser. Even more, some kitchen islands are easy to move and relocate; a good example of such kitchen is "Tokyo Kitchen" – the compact kitchen is attractive and gives a possibility to arrange the two separates islands optionally, or to put the islands together in one, perfectly fitting piece [35].

The island kitchen doesn't have to look like an integrated kitchen equipment. Some of those ideas let not only to relocate it, but to fold it in a sort of sculpture, which looks like a sculpture, not identified with kitchen equipment. The Brazilian futuristic "O kitchen" with a spherical shape, after the meal preparation, can be folded, and looks like a giant mysterious white ball, which encourages exposing it [36].

The kitchen island found a permanent place amongst the functional arrangements of kitchen area. Its constant evolution seems to be setting the future of an optimally designed kitchen.

The open kitchen model, in analogy to the primitive multifunctional homesteads, unites the family in the food preparing area. However, unlike them, that gathering is not forced by the presence of fire, but it is a conscious action to integrate the family members. It is very important nowadays, because of the reduction of family meaning as a basic social unit.

5 Summary

Combining the work kitchen with the social part of apartment, is connected with some functional-spatial changes of kitchen area, which opens to the daily area more and more often, creating an open common space. The tendency to improve the kitchen appearance and details' quality is an effect of those changes, as well as initiating the solutions, which exalt the kitchen's meaning and increase the daily comfort of its usage. Future design tendencies are more and more frequently based on ergonomic criteria, which provide the correct realization of technological processes, with the simultaneous consideration of the technical progress, and the assurance of the

convenience and the safety for users. The widely understood technical progress generates the changes in domestic kitchen.

The evolution of domestic kitchen is a constant process, and because of that fact it changes continuously. Modern equipment, which found a permanent place in the kitchen area, needs to be analyzed because of appearance of still unexplored designing and ergonomic relationships, in order to eliminate the safety hazard. Designers should enhance their knowledge in domain of ergonomics, not only to modernize existing, wrong resolutions, but most of all to apply the prevention of design mistakes in new built apartments. It is necessary to bring in some kind of kitchen operating instruction manual, which will make it easier to use, safely and comfortably, for both healthy and disabled users. Specifying threats is very important, showing the ways of avoiding them, and explaining the meaning of the accident prevention. The necessity of the widely ergonomic education of household members seems to be the priority. The usage of the conceptual ergonomics in designing process, including the steps necessary for the adaptation of the kitchen area to the changing needs of the user, minimizes or even eliminates the need of further modernizations in the future. The existing solutions, thanks to the corrective ergonomics, can gain features of the optimally designed kitchen. Because of the changing range of kitchen works, which is connected with technical progress, functional changes and technological innovations, a research continuation is needed, as well as a periodic verification of the kitchen equipment and the technology of kitchen work.

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