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PROCESS OPTIMISATION AS EXEMPLIFIED BY SCHOOL CAFETERIA WORK ORGANISATION

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Abstract: The aim of this paper is to present suggestions for optimisation of the process of meal preparation in schools, which would lead to a reduction in the operating costs of the facility and more effective use of the resources in question. As a result of the research it was found that in the organisation studied there exists a real possibility of staffing reductions from 4 to 3.5 full-time jobs, which would directly translate into a reduction in the costs related to running an institutional catering establishment. The schedule prepared also enabled determining the shortest possible time of performing the entire meal preparation process, which also constitutes the critical path.

Keywords: process optimisation, Gantt chart, schedule, streamlining, institutional catering, school cafeteria.

1. INTRODUCTION

In Poland, it is standard practice that children in pre-schools and schools are provided catering, similarly to other nations in the European Union. Providing catering to the pupils is an element of caretaking that must be performed at any such institution. Educational institutions handle this issue in one of two ways. Those that have the infrastructural capacity, as well as material and human resources, prepare meals by their own means. The others employ specialist companies to deliver meals for children and youths.

From the perspective of a public school, which is financed from the national budget, it is worthwhile considering possibilities for optimising the processes involved in meal preparation. This could provide information, the use of which would save time and money. For this reason, this study was intended to identify possibilities of optimising the meal preparation process in a schooling institution. The authors made the following hypothesis: analysing the meal preparation process

in a cafeteria using scheduling tools enables optimising the process in terms of two interrelated criteria – duration and cost of completing the entire process.

Optimisation is defined in professional literature as an action identifying the best solution for an analysed problem from the perspective of the selected criteria. Through the use of optimisation, an organisation can improve its operations considering its own criteria, the most important from its perspective, which consequently leads to improving the quality of its operations [Wiśniewska and Muzolf 2012]. In the analysed case, optimisation is considered an action that streamlines the process of meal preparation in a school cafeteria, which is intended to provide better utilisation of the resources involved in running the process. The optimisation performed was multicriterial and should lead to a reduction in the organisation's operating costs and to better utilisation of the resources of the staff employed at the analysed institution.

2. THE CONCEPT OF OPTIMISATION

In all cases, achieving the goals defined by an organisation requires performing processes, defined as a set of interrelated actions, which for commercial organisations should lead to satisfying the needs of their customer. It should be noted that the concept of a process in the literature is defined much more broadly than the concept of an action, task or procedure [Ossowski 2012].

One condition for properly performing the analysis of a process is that all actions that need to be performed to complete the entire process must be identified first. Each action can be characterised using three parameters:

a) time to complete the action – its duration can be estimated based on observing a work day of the staff involved in performing the action in question,
b) cost to complete the action – actions performed within a business contain within them commercial operations that lead to changes in the assets of the company and must be recorded in the books [Auksztol and Chomuszko 2012], which enables determining their cost through an analysis,
c) work scope – a characteristic of individual actions and resources that must be performed and utilised to complete the action in accordance with the expectations for a given action.

At the same time, it must be noted that there is a very strong connection between the above parameters. Each of them affects the other two. The first two parameters describing an action can be treated as the resources of an organisation, utilised to complete the entire process. In each instance, completing the process requires that, in addition to the above, the institution also uses other resources, which can be included in the parameter defined as 'scope'. From the standpoint of completing the

process, human resources are of course essential; even the most highly automated process cannot function without at least some human staff. Of course, the type and amount of the resources necessary to complete a process will depend on the complexity of the action in question. It appears that the key resource enabling most actions to be performed are financial resources, as thanks to the high liquidity of these resources they can usually be very quickly exchanged for other resources necessary to perform a given action.

At the next stage of analysing the entire process, the relations existing between the individual actions identified within the process must be determined. The body of knowledge amassed during these two stages enables piecing together the schedule for performing the entire process – a sequential compilation of all the actions performed within the process. On the one hand, the schedule enables determination of the time to complete the entire process and, on the other, it provides an opportunity to analyse its course in terms of how each resource is utilised. By analysing the process flow it is possible to pick the optimum variant, which will be the most beneficial from the standpoint of achieving the goals of a given institution, as close to perfection as possible.

Optimisation (Latin: *optimus* – superior) is defined as selecting the best solution [Palczewski 2018] to an analysed problem from the perspective of the criteria selected by the person conducting the analysis. The difficulty of optimisation for most social sciences usually lies in determining the lowest or highest value of a problematic parameter [Stachurski and Wierzbicki 1999]. It is noted in the literature that optimisation may involve a single or multiple criteria – the actions taken concern improving one or several parameters. For economic sciences, optimisation is usually associated with minimising the running costs of an entity. It should be noted, however, that by minimising its costs, an organisation can at the same time maximise the profits generated – two goals can be achieved at the same time, therefore the optimisation is two-criterial based [Rummler and Brache 2000]. Optimising the costs associated with processes mostly entails actions involving a verification of the process running costs, their analysis, optimisation of the primary actions making up the processes, and optimisation of the process support actions [Knop and Mielczarek 2015]. The following are indicated as the main benefits of using production process optimisation:

a) completeness of knowledge concerning the costs involved in performing a process,
b) ability for a business to function based on optimal costs,
c) ability to use a multi-criterial approach to managing an entity,
d) greater security for the functioning of an entity and lower vulnerability to unexpected situations, enabling it build competitive advantages,
e) ability to streamline various areas of a given entity's operations,
f) ability to minimise costs while at the same time maintaining a satisfactory level of quality of the offered products [Trocki 2012].

It should be noted that due to the dynamically changing environment and changes occurring within the organisation itself, process optimisation is an ongoing process. A certainly important element of any optimisation-related action is proper visualisation of the process. A simple and at the same time highly useful tool for analysing and visualising a process is the Gantt chart [Chmielewski 2021], which has been used in commercial environments for over a hundred years.

3. GANTT CHART AS A PROCESS OPTIMISATION TOOL

The Gantt chart is a tool that, even though it was created at the end of the 19th century, is still often used for planning production processes, both for processes and projects [Wysocki and McGary 2005].

There are three types of Gantt charts identified in the literature:

a) resource load chart – used to present the amount of work done by individual resources involved in an organisation (staff, machines, equipment);
b) chart of staff work station and machine arrangement – complements the resource load/time chart and provides a method of tracking progress in the actions performed;
c) project chart – a presentation of all the actions making up a project, enabling the start and end times of individual actions to be identified [Zbichorowski 1977].

Due to their widespread use in the operations of organisations, Gantt charts today are used most often for the presentation of project charts. Both the project and the process comprise a set of actions performed to complete them, while a project differs from a process by the low repeatability of the actions performed. The low repeatability of the actions is the key difference between a project and a process. All three types of Gantt chart are very similar to one another and present individual actions performed within a process or project using horizontal bars.

A process/project schedule is prepared by using the horizontal bars as the element representing the individual actions, while the bar lengths indicate the duration of each action. Bar placement takes into account the causal relations between individual actions. Bar positioning in the chart enables the start and end time of individual actions performed within a process/project to be identified. The concept of the critical path (Critical Path Method – CPM) is very commonly used together with Gantt charts, which serves to identify within a project those actions that have no time margin – so they cannot be delayed if the process/project is to be completed as scheduled. The critical path visualises the shortest time to complete a given process/project [Jędrzejczyk et al. 2011]. Knowing the critical path for processes and projects is an important element that improves the efficiency of managing actions performed within an organisation. For example, it enables efficient reallocation of resources within the operations performed, as well as elimination of downtimes identified in the process/project.

Preparing a Gantt chart is done in three stages, which largely correspond to the actions performed during a process analysis, which are:

- stage I – identification of the actions present in a process/project;
- stage II – determination of the duration of the actions identified, and the causal relations between individual actions;
- stage III – graphical presentation of the actions performed within a process/project [Grześ 2014].

The popularity of Gantt charts stems from a number of advantages that this form of visualising the actions taken within an organisation provides. The most commonly mentioned ones are [Trocki 2012]: ease of preparation, ease of absorbing the information presented in the chart, ability to determine the critical path, ability to present a very large number of actions, ability to control the actions performed within a process/project. On the other hand, the main drawbacks associated with this technique of visualisation include: inability to show the logical relations between individual actions in a process/project, difficulty in reading processes/projects made up of high numbers of actions. Due to the advantages mentioned above, the Gantt chart is a tool used in a multitude of industries for analysing the processes and projects they conduct.

4. ORGANISATION OF THE CATERING PROCESS IN AN EDUCATIONAL INSTITUTION

The organisation of institutional catering in public schools is regulated by the Education Law act [Ustawa z 14 grudnia 2016], which stresses that children and youth nutrition is part of performing the caretaking duties of the school, with particular importance placed on the correct development of the students. Pursuant to article 106 of the act, "a school may organise a cafeteria". This is preconditioned on the school's organisational and financial capacity. Not all school or pre-school buildings are equipped with a fully developed or equipped catering department. The construction or modernisation process may generate high costs, and in such cases many educational institutions provide food to children by means of third-party catering. Both in this variant and when meals are prepared in the institution's own kitchen, the fees are paid by the children and youths' guardians. In the case of public institutions, the meal fee paid by the parents of the children only covers the value of the "kettle charge". This means they pay only for the materials and ingredients used to produce the meals. The other costs (catering staff compensation, energy costs, machine and equipment purchase costs are covered by the body running the institution. The director of the institution has to agree to the fee amount with the body running the institution.

The rules governing the functioning of catering departments are subject to similar requirements as other gastronomic services. Pursuant to the Act on food and nutrition safety [Ustawa z 25 sierpnia 2006], institutions are obligated to have a functioning HACCP (Hazard Analysis and Critical Control Point) system in place.

The starting point and so-called precondition for implementing a HACCP system is the implementation of Good Hygienic Practices, which cover a range of areas, including ensuring the proper functionality of rooms, washing and disinfection processes or staff training.

There are no separate guidelines concerning criteria for the organisation of work in a catering department that would apply to schools. Generally accepted requirements are applied. Catering departments must be separated from the other areas where children and youths spend their time, particularly to maintain basic safety principles. However, the functional arrangement of the meal preparation department[1], its size and complexity, define the work organisation and efficiency of such work processes as: supply and storage, production volume and quality, turnover amount, and service quality level. The equipment and dishes used must be maintained perfectly clean. Additionally, they must be made of materials approved for contact with food [Turlejska 2008]. A general rule for implementing a HACCP system is to ensure that all stages, actions or locations where potential food safety hazards may occur must be continuously monitored. An extremely important element is to maintain records to confirm the completion of tasks that ensure control.

The foundation of gastronomy is the production of a dish or meal [Milewska, Praczko and Stasiak 2010] that must be characterised by an appropriate, desired quality. A production process in gastronomy usually comprises the delivery of ingredients, their storage, pre-processing (e.g. sorting, washing, cleaning, fragmenting), heat treatment (e.g. boiling, frying, roasting), and shipping finished meals. When preparing salads and, for example, juices, there is no heat treatment, while in the processes performed in schools and pre-schools there is no serving stage (table service). However, for the meal production process to run properly, high-quality and safe ingredients, and safe conditions for performing the process, must be provided. The responsibility for ensuring such conditions rests on the institution management and directly on the catering department staff. A well-organised work time for the staff and its dedication, experience and awareness in ensuring food safety [Malinowska 2017] are conditions ensuring that high-quality and safe meals are produced. It must be noted, however, that from the perspective of the institution, maintaining rational costs of achieving this goal is an important factor.

[1] The functional arrangement of a food establishment is the spatial association of rooms that implement to the greatest degree possible the requirements applicable to the production and flow direction of goods, staff and consumers [Koziorowska and Biernat 2016].

5. PROCESS CHARACTERISTICS BEFORE OPTIMISATION

5.1. Purpose and methodology of the study

As has been mentioned already, producing safe and tasty meals does not depend solely on the expertise and competences of the staff. It is also related to the ability to properly organise the work time, so that the actions performed are efficient and do not lead to wasting time and other resources of the entity organising the process. Therefore, the aim of this paper is to present suggestions for the optimisation of the process of meal preparation in schools, which should lead to a reduction in the operating costs of the facility and more effective use of the resources in question.

To achieve the goal of this study, the individual case method was used, supplemented with catering department staff interviews and observations of the actions they perform, including their time intensiveness and an assessment of the operating costs of the institution based on existing accounting documentation.

The object of the study was the work organisation of the catering department of a selected educational institution. The main research issue was the answer to the following question: Can the lunch preparation process can be streamlined/optimised, considering the number of people employed, and can their work time be optimised? Additionally, an attempt was made to answer the following question: What is the optimum number of full-time job equivalents for the catering department employees of the analysed institution?

Based on observations (work day photograph method [Martyniak 1985]) and interviews made, a characteristic of the work organisation in the studied catering department was made. The study was conducted at the catering department in one of Tri-City's primary schools in the second half of November 2021. During this period, lunches were being prepared for 170 students by 4 workers: a cook and three cook's assistants. The staff began work at 06:00 and, in accordance with their contracts, worked until 14:00 (every worker was employed for a full-time, 8-hour job).

5.2. Description of work organisation at the studied institution

At the beginning of each work day the cook receives the goods, performs quantity and quality acceptance, and completes relevant documents. He or she also inspects the temperatures in the cold storage equipment. The other people employed are involved in the fruit and vegetable manual processing processes (see Fig. 1). The responsibility for performing the subsequent process actions, up to action I, rests on a single person (see Tab. 1), although receiving the goods and making relevant records is the responsibility of the cook, the ongoing housekeeping and preparation of the starch additive for the soup is the responsibility of one of the cook's assistants. Pre-processing of meat (action J) is performed for half an hour by two people (from

08:30 to 09:00), after which time the cook takes over the responsibility for this action (Fig. 2b). The subsequent process actions (K-O) are handled mainly by individuals.

Students eat lunch in the school in question between 10:45 and 11:30. Due to the current pandemic situation, the staff issues and delivers meals for the children to the tables. One worker pours and delivers the soup, the cook portions the second course, another assistant delivers it, while the third assistant is assigned to collecting and washing plates and cutlery from the tables. At 11:15 a nutrition technician arrives to assist. Actions related to housekeeping after preparing and issuing the lunch portions are assigned to individuals. The kitchen staff finishes work at 12:45. Figure 1 shows the meal preparation process schedule prepared on the basis of the actions identified during the observations, including the durations of the individual actions.

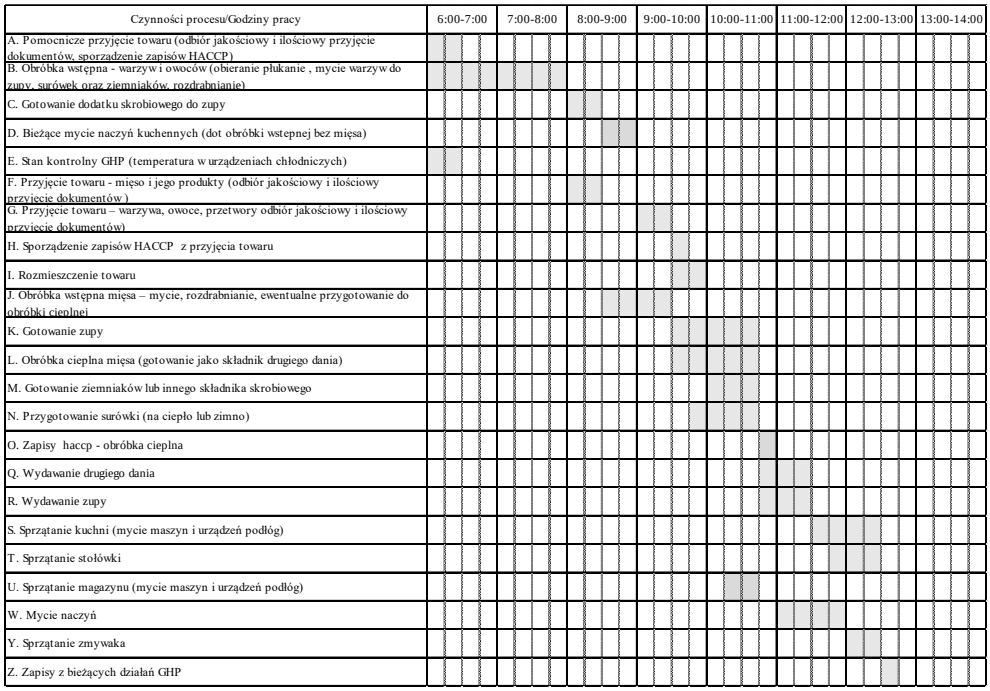

Fig. 1. Work day schedule before the optimisation process

Source: own study.

To be able to determine the critical path of the process for the purpose of its optimisation, both the duration of individual actions and the necessity to complete others that are essential to ensure a continuity of the entire process must be considered. For the purpose of presenting the relations between the individual actions, the term ‘predecessor’ is used - an action that precedes a specific action.

Information on the duration of individual actions, their predecessors, and the volume of the human resources required to perform the individual actions is shown in Table 1.

Table 1. Timetable of the process

Action	Duration of actions		Number of involved people	Predecessor
	from	to		
A	06:00	06:30	1	-
B	06:00	08:00	3	-
C	08:00	08:30	1	B
D	08:30	09:00	1	B, C
E	06:00	06:30	1	-
F	08:00	08:30	1	-
G	09:00	09:30	1	-
H	09:30	09:45	1	F, G
I	09:30	10:00	1	G
J	08:30	09:30	1.5	F
K	09:30	10:45	1	A, B, C, F, G, J
L	09:30	10:45	1	A, B, F, J
T	10:00	10:45	1	B
N	09:45	10:45	1	A, B, G
A	10:45	11:00	1	K, L, M, N
Q	10:45	11:30	2	L, M, N
T	10:45	11:30	1	K
S	11:30	12:30	1	Q, R
T	11:45	12:30	1	Q, R
U	10:15	10:45	1	G, H, I
T	11:00	12:00	1.5	Q, R
Y	12:00	12:30	1	T
Z	12:30	12:45	1	S, T, U, Y

Source: own study.

With the information included in Table 1, a schedule of the process can be compiled (Fig. 2a). This indicates the individual actions that occur in the process in question. Additionally, actions in italics indicate those that are low time-consuming (symbols in the HACCP documentation – E, H, Z), while action W is underlined, which in the Table 1 record should begin only after actions Q and R, but it was decided it could be started earlier. This is predicated on the actual conditions – the children eat the meals successively from 10.45 to 11:30, dish washing can therefore begin, for example, after the first 15 minutes. Using the collected data, Figure 2b visualises the number of people involved in each action and shows a summary of the manpower required to perform the process.

a

6:00-7:00				7:00-8:00				8:00-9:00				9:00-10:00				10:00-11:00				11:00-12:00				12:00-13:00				13:00-14:00			
A	A													L	L	L	L	L													
B	B	B	B	B	B	B	B	C	C	J	J	J	J	K	K	K	K	K	R	R	R	S	S	S	S	*Z*					
E	*E*							F	F	D	D	G	G	*H*		M	M	M	Q	Q	Q		T	T	T						
															N	N	N	N	O	W	W	W	W	Y	Y						
														I	I								U	U							

b

	6:00-7:00				7:00-8:00				8:00-9:00				9:00-10:00				10:00-11:00				11:00-12:00				12:00-13:00				13:00-14:00			
	1	1													1	1	1	1	1													
	3	3	3	3	3	3	3	3	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
	1	1							1	1	1	1	1	1	1		1	1	1	2	2	2		1	1	1						
																1	1	1	1	1	1	2	2	1	1	1						
															1	1								1	1							
SUMA	5	5	3	3	3	3	3	3	2	2	3	3	2	2	4	4	4	4	4	4	4	5	3	4	4	3	1	0	0	0	0	0

Fig. 2. Process flow visualisation

Source: own study.

Considering the usage of human resources, the analysis of process performance indicates a highly varied need for the number of workers employed. The number of people involved in performing the processes varies throughout the period, from 1 to 5 people. Considering that, in practice, the department directly involved in performing the process employs 4 people, this means that the available manpower is not always fully utilised, and maintaining them entails costs for the institution. It is notable that between 11:15 and 11:30 an additional person above the 4 already employed needs to be involved. However, it should be noted that until 09:30 (except a short period during the initial part of the process), the need for manpower is no greater than 3 workers. It is only after 09:30 until 12:30 that all people employed in the department (4 people) are fully utilised. It also appears that this variability in worker involvement can form a basis for changes optimising the manpower demand, and consequently also for the optimisation of process costs.

6. PROPOSED OPTIMISATION ACTIONS

Process optimisation is done for various reasons. For the institution in question, optimisation is intended to result in a uniform utilisation of the human resources and in reducing the number of people involved in the performance of the process, which overall may mean savings in the expenses borne by the institution.

Based on the collected information it was possible to determine the critical path (see Fig. 3a), which is the sequence of actions that have no time margin – they must

be done as planned, otherwise the entire process will be prolonged. These are the sequential actions: B, C, J, K, R, S, Z and L, Q, which re also embedded in the process at fixed times, without any adjustments possible.

a

6:00-7:00				7:00-8:00				8:00-9:00				9:00-10:00			10:00-11:00				11:00-12:00				12:00-13:00				13:00-14:00			
A	A													L	L	L	L	L													
B	B	B	B	B	B	B	B	C	C	J	J	J	J	K	K	K	K	K	R	R	R	S	S	S	S	Z				
		E	E					F	F	D	D	G	G	H		M	M	M	Q	Q	Q		T	T	T					
															N	N	N	N	O	W	W	W	W	Y	Y					
														I	I								U	U						

b

	6:00-7:00				7:00-8:00				8:00-9:00				9:00-10:00			10:00-11:00				11:00-12:00				12:00-13:00				13:00-14:00			
	1	1												1	1	1	1	1													
	3	3	3	3	3	3	3	3	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
			1	1					1	1	1	1	1	1	1		1	1	1	2	2	2		1	1	1					
															1	1	1	1	1	1	2	2	1	1	1						
														1	1								1	1							
SUMA	4	4	4	4	3	3	3	3	2	2	3	3	2	2	4	4	4	4	4	4	4	5	3	4	4	3	1	0	0	0	0	0

Fig. 3. Process flow visualisation after the optimisation

Source: own study.

The next step was to identify the changes that may lead to an optimisation of the process. The first such example was an analysis of the action flow in the first hour of work time. Based on the research it was determined that at 06:00, three actions begin – A, B and E. A fixed action that is not subject to change is action B, part of the critical path. Its duration affects the completion time of the entire process and it cannot be modified. What can be modified, however, is action E. This action involves inspecting the temperatures in the coolers and freezers, which in practice can be done in 15 minutes. It may also happen that the supply delivery does not arrive on time. For this reason, it was decided that, during the first hour, the organisation of work related to action E can be modified. As the first optimisation action, it is suggested to postpone action E by half an hour (see Fig. 3a). As a result, the cook's assistants are involved in performing action B, while the cook's task is the quantity and quality acceptance of the goods, and monitoring the storage conditions. Execution of the process after the modification, including the consequences concerning the manpower requirements, is shown in Figure 3.

Another modification should concern the period from 11:15 to 11:30, where 5 people are involved in the work. It is a time where performance of the process must be supported by additional manpower. It should be emphasised that the process actions from 10:45 to 11:30 pose a certain limitation. They cannot be moved in time

and they require maximum utilisation of the available human resources. Their concurrent performance requires involving another person from outside the studied department. Observations of the process showed that at full process capacity (170 lunches issued), this stage cannot be modified by reducing the manpower to 4 people. If the organisation decides to proceed with reducing the number of employees, the duration of action W may become longer, which, however, will not adversely affect the flow of the entire process as the action is outside the critical path.

Observing the personnel requirements for the studied process, it can be noted that the department needs to be fully staffed (4 people) only in the initial period (from 06:00 to 07:00) - if all the actions envisioned within the process can be done using only 3 people, by intensifying work or by using another person employed in a different department, then the requirement for 4 people would emerge only from 09:30 onwards, and would continue until 12:30 (see Fig. 3b). Optimising the employment related to performing this process would mean that completing it requires 3 full-time people and one part-time person – for the 09:30 – 13:30 period (the actual demand for this person's work ends at 12:30, but they can be used to help with the other actions). Performing the process under the streamlined schedule would also require involving for a period of 1 hour and 15 minutes the support of a person from outside the department directly related to the process. This person would be needed at two points in time, at the beginning of the process (from 06:00 to 07:00), and during the period from 11:15 to 11:30. However, if actions A, B and E are streamlined so that they can be performed by 3 people, involving another person from outside the department to perform the process would be limited to only 15 minutes. Reiterating the reasoning presented previously, without the assistance of this outside person, the process could be slightly extended, and the number of workers involved in individual actions would remain unchanged.

However, the organisation of work after 12:45 should also be discussed. As has been shown above, actions related to housekeeping and completing HACCP documentation can take until 13:00, assuming that one of them takes longer. It turns out that the organisation does not utilise the resources of 4 hours of paid work time – 1 h per each of the 4 employed people. The process schedule analysis demonstrated that during the last hour of work, the workers have no actions assigned to be performed. Therefore the body running the institution bears the cost of PLN 84[2] while receiving no benefit in exchange. For this expense not to be wasted, it may be proposed that the catering department staff become involved in other actions performed at the institution, for example housekeeping in other areas of the school.

[2] The calculations assume that a 20% bonus and a 20% seniority allowance is added to the basic compensation for classification category VI (PLN 2400), translating to a total hourly wage of PLN 21 – which, with 4 people employed, means 4 x PLN 21 = PLN 84. [Rozporządzenie RM z 25 października 2021].

Fig. 4. Number of people involved in performing the process vs. variant adopted

Source: own study.

To summarise, a reduction of full-time jobs in the catering department from 4 to 3.5 can be proposed (see Fig. 4). In this case, with the proposed process optimisation, the body running the institution can save up to PLN 1680 monthly. From 06:00 to 09:30 the work should be performed by 3 people, and later on until 13:30 by 4 people, with 3 people again remaining for the last half an hour. The personnel directly involved in performing the process can be supported by the nutrition technician, who can, for example, take over keeping the HACCP records. An outside person's assistance in handling action W does not seem necessary, however. As has been noted above, the organisation can afford to extend the dish washing action, so that the time after the process is completed is more efficiently utilised.

The final decisions concerning work organisation in the catering department should be left to the relevant body, but the example shown clearly indicates there is room for changes ensuring better returns for the cost of running the institution.

7. CONCLUSIONS

The presented analysis of the meal preparation process flow in the catering department of an educational institution showed that there is a possibility of implementing streamlining changes through the use of a simple tool in the form of a schedule. Preparing a schedule divided into single actions making up the process and determining the critical path aided in presenting the time optimisations for the entire process, and consequently in identifying potential savings.

The image showing the staff's involvement in individual actions visualised the high variability in demand for manpower before the optimisation was made. With the changes made, the stability of demand for workers within the process in question is improved. At the same time, it was noted that the need to involve 4 workers only

appears during about 4 hours across the entire process. The analysis demonstrated, therefore, that the actual demand throughout the process is for 3 full-time people and one part-time person. This improvement of the process will be made possible by intensifying work during the first hour of process performance. However, an accurate analysis of the actions performed by individual people within the process, and an appropriate division of tasks between the individual workers will be necessary.

It must also be noted that the proposed changes should not lead to any reduction in the quality of the services provided. The staff of the catering department in question are experienced, they have appropriate qualifications and skills. Furthermore, the workers participate in training that constantly expands their expertise and improves their qualifications. The department's employees are familiar with and apply basic principles of ensuring food safety.

The research presented in this paper has demonstrated a need for a closer look at work in this type of institutions. It can be observed that by streamlining the process organisation it is possible to generate savings that result in more effective utilisation of the resources the entity has at its disposal. Considering that the local government unit in question has over 100 subordinate entities that prepare meals throughout the month, such savings can add up to several thousand PLN, while requiring only relatively simple actions to be taken. At the same time, the additional time gained through the optimisation of the process should translate to an improved quality of the services provided by the entity.

REFERENCES

Auksztol, J., Chomuszko, M., 2012, *Modelowanie organizacji procesowej*, Wydawnictwo Naukowe PWN, Warszawa.

Chmielewski, M., 2021, *Planowanie sytuacji finansowej z wykorzystaniem wykresu Gantta/-Adamieckiego* [in:] *Decyzje finansowe w życiu osobistym i gospodarczym*, Centrum Myśli Strategicznych, Gdańsk, pp. 112–134.

Grześ, A. 2014, *Wykres Gantta a metoda ścieżki krytycznej (CPM)*, Optimum Studia Ekonomiczne, no. 4, pp. 195–216.

Jędrzejczyk, Z., Kukła, K., Skrzypek, J., Walkosz, A., 2011, *Badania operacyjne w przykładach i zadaniach*, PWN, Warszawa.

Knop, K., Mielczarek, K., 2015, *Aspekty doskonalenia procesu produkcyjnego*, Zeszyty Naukowe Quality, no. 1, pp. 69–82.

Koziorowska, B., Biernat, M., 2016, *Projektowanie technologiczne zakładów gastronomicznych, kuchni hotelowych i szpitalnych*, Gastro-Projekt, Warszawa.

Malinowska, E., 2017, *Postrzeganie znaczenia kryteriów systemu bezpieczeństwa żywności przez pracowników placówek gastronomicznych* [in:] Sikora, T. (ed.), *Zarządzanie jakością w perspektywie organizacyjno-społecznej*, Wydawnictwo Naukowe PTTŻ, pp. 417–430.

Martyniak, Z., 1985, *Techniki organizatorskie, Zastosowania w organizowaniu prac administracyjno-biurowych*, Akademia Ekonomiczna w Krakowie, Kraków.

Milewska, M., Praczko, A., Stasiak, A., 2010, *Podstawy gastronomii*, PWE, Warszawa.

Ossowski, M., 2012, *Identyfikacja i klasyfikacja procesów w przedsiębiorstwie*, Zarządzanie i Finanse, no. 4, pp. 297–312.

Palczewski, J., 2014, *Matematyka stosowana. Optymalizacja II*, Wydawnictwo, Uniwersytetu Warszawskiego, Warszawa, https://www.mimuw.edu.pl/~jpalczew/ (19.01.2022).

Rozporządzenie Rady Ministrów z 25 października 2021 r. w sprawie wynagradzania pracowników samorządowych, DzU, 2021, poz. 1960.

Rummler, A.G., Brache, A.P., 2000, *Podnoszenie efektywności organizacji*, PWE, Warszawa.

Stachurski, A., Wierzbicki, A., 1999, *Podstawy optymalizacji*, Oficyna Wydawnicza PWN, Warszawa.

Trocki, M., 2012, *Nowoczesne zarządzanie projektami*, PWE, Warszawa.

Turlejska, H., 2008, *Zasady Dobrej Praktyki Higienicznej oraz system HACCP przy sporządzaniu posiłków szkolnych* [in:] *Obiady szkolne z uwzględnieniem Dobrej Praktyki Higienicznej oraz systemu HACCP dla posiłków szkolnych*, Wydawnictwo IŻŻ, Warszawa, pp. 57–76.

Ustawa z 25 sierpnia 2006 r. o bezpieczeństwie żywności i żywienia, DzU, 2006, nr 171, poz. 1225, z późniejszymi zmianami.

Ustawa z 14 grudnia 2016 r., Prawo oświatowe, DzU, 2021, poz. 1082.

Wiśniewska, M., Muzolf, A., 2012, *Model doskonałości – Swissmed Excellence Model*, Prace i Materiały Wydziału Zarządzania Uniwersytetu Gdańskiego, Gdańsk, pp. 91–111.

Wysocki, R., McGary, R., 2005, *Efektywne zarządzanie projektami*, 3rd edition, Helion OnePress, Gliwice.

Zbichorowski, Z., 1977, *Metody graficzne w organizacji i zarządzaniu produkcji*, WNT, Warszawa.