Humanities and Social Sciences **2021**
Research Journal 28, No. 2 (2021), pp 17-31 **April-June**

Krzysztof GAWRYSIAK[1]
Rafał MIĘTKIEWICZ[2]

TACIT KNOWLEDGE IN MILITARY SERVICE ACTIVITIES

This paper reports on a part of a broader and more comprehensive research study (i.e., research designed to answer additional research questions and requiring additional research methods to be employed than those reported herein) carried out from May 2017 to January 2019 and aimed at determining the impact of the Experience Use System[3] on the operational capabilities, organizational culture, and approaches to knowledge management in the Polish Armed Forces. To carry out this part of the research, a survey was administered to professional soldiers and employees of the Ministry of National Defence, and the goal of the research was to determine "how much of the information needed to perform your duties do you have in your head." This study is based on the findings of independent investigations by Stephen Hawking of Cambridge University, Nick Bontis of McMaster University, and Robert Kelley of Carnegie-Mellon University.

Keywords: organizational learning; knowledge management; information stored in mind; diagnostic survey; statistical analysis.

This paper is a report of part of broader and more comprehensive research (more problem questions and research methods) carried out from May 2017 to January 2019, aimed at "Diagnosis of the impact of the Experience Use System on the improvement of operational capabilities, organizational culture and approach to knowledge management in the Polish Armed Forces". The goal was to conduct a survey in which professional soldiers and employees of the Ministry of National Defence were asked: "How much of the information needed to perform your duties do you have in your head". This study is based

[1] CDR (OF-4) Krzysztof Gawrysiak, PhD, Commander Adjunct, Maritime Operations Section, Department of Command and Maritime Operations of the Polish Naval Academy of the Heroes of Westerplatte, 69 Śmidowicza St, 81-549 Gdynia; e-mail: k.gawrysiak@amw.gdynia.pl. ORCID: 0000-0001-9083-4364.

[2] CDR (OF-4) Rafał Miętkiewicz, PhD, Commander Adjunct, Maritime Operations Section, Department of Command and Maritime Operations of the Polish Naval Academy of the Heroes of Westerplatte, 69 Śmidowicza St, 81-549 Gdynia; e-mail: r.mietkiewicz@amw.gdynia.pl (corresponding author). ORCID: 0000-0002-3129-7092.

[3] The Experience Use System is the Polish national equivalent of the NATO Lessons Learned allied system and is one of the organizational learning tools of the Polish Armed Forces. By integrating knowledge management processes (identification of observation, analysis, dissemination) and change management (planning implementation of corrective actions and setting tasks, implementation of corrective actions, verification of corrective actions), it improves the effectiveness of tasks performed at all levels of command and in all functional components (areas).

on the findings of independent investations by Stephen Hawking of Cambridge University, Nick Bontis of McMaster University, and Robert Kelley of Carnegie-Mellon University.

1. INTRODUCTION (GROUNDS FOR INITIATING STUDIES)

In almost every aspect of human life, both at work and in private, there has been a notable increase in the amount of available information. Rough estimates indicate that the last hundred years of human development have generated more information than the entire history of mankind. This was confirmed by research conducted by Stephen Hawking, who compared the number of scientific publications published during the 20th century. He stated that in 1901 there were about nine thousand; half a century later in 1950, almost ninety thousand; in 2000, this number exceeded nine hundred thousand (Hawking, 2002), as shown in Table 1.

Table 1. Scientific publications in selected years of the 20th century

Year	1901	1950	2000
Number of publications	9000	90 000	900 000

Source: (Hawking, 2002).

The amount of information generated in the 21st century was so large that Stephen Hawking stopped measuring the number of publications. With the development of information technologies that enabled data and information archiving, analyses expressed in computer logic memory units began. At the beginning of the 21st century, he estimated that more than a million bits of data and information are added each second (Hawking, 2002). This trend is reflected in and confirmed by the findings of Stephen Hawking's research on the doubling of information gathered and developed by mankind. In the publications at the turn of the millennium, the most frequently quoted statements are: “every seven years” or “every five years”. At that time, Nick Bontis predicted that in 2010, all the codified knowledge of mankind would double every 11 hours (Bontis, 2001).

Essentially, people are both the creators and beneficiaries of information, holders of knowledge, and often wisdom. The existence, survival, and development of humanity are closely related to the development of the human intellect, knowledge, and thus to the amount of gathered and properly used information. High dynamics in this area, confirmed by the results of scientific research, create both opportunities (civilizational development) and challenges (at this stage, the use of the term “threat” would not be justified). Unfortunately, human capabilities to perceive, remember, and use information do not develop as rapidly. The human central nervous system is incomparably more complex than the architectural conditions of library development or the development of electronic databases using computer hardware and software.

In the face of increasingly complex and advanced analytical activities undertaken by people, requiring access to huge and reliable repositories of information raises the question: what percentage of information is needed to perform duties that we store in an intangible way (“in our own heads”)? This value is supplemented up to one hundred percent by information in tangible form: memos, drawings, diagrams, documents, publications, monographs, etc. in printed or electronic form.

The above results overlap with results indicating a decreasing IQ in each subsequent generation (up to 7 points). This hypothesis was based on a sample survey of male recruiters aged 18-19 years, Norway nationals, as part of an IQ test, which is an integral part of the service. The analysis showed that among the generation born after 1975, not only did the Flynn effect stop[4], but within one generation the quotient dropped by as much as 7 points (Grygiel, 2019).

On the other hand, there are theories concerning the content of such tests which do not conform to modern conditions, especially the ubiquitous achievements of technique and technology. Attention is drawn to the issues of differentiation of crystallized intelligence, which includes learned matters, and liquid intelligence, which includes inborn abilities to use logic (Bednarek, 2019).

This problem was addressed among knowledge workers by Robert Kelley, who over three decades beginning in the mid-1980s, asked one question to a diverse and wide range of respondents: "What percentage of the knowledge you need to do your job is in your head?". In 1986, the average answer was 75%. In the next study, conducted after eleven years, he achieved a result of 15-20%, showing a decisive downward trend. The next study, conducted after the next nine years in 2006, showed the continuation of this trend, but it was difficult to expect significant changes at an already low rate, and the final result was only 8–10% (Goleman, 2007). Figure 1 provides an appropriate overview.

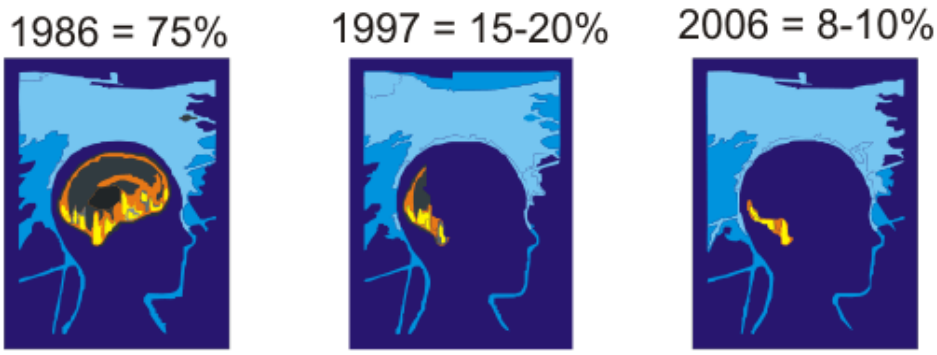

Figure 1. Summary of the results of tests carried out by Robert Kelley

Source: https://rapidbi.com/training-learning-development-is-dead/ [Access: 09.02.2019].

The quoted results of Robert Kelley's research may seem surprising, especially when they are applied to the entire population. The key to understanding them, however, is to explain the concept of the "knowledge workers" who were surveyed and whom the results concern. To this end, it is worth quoting the definitions of knowledge management classics, namely Thomas Hayes Davenport of Harvard University and Peter Drucker of New York University. Thomas Davenport states that a knowledge worker is a person with an appropriate education and professional experience and a high level of expertise, and the work they do requires them to produce and distribute knowledge (Davenport, 2005). Peter Drucker for (Elliman, Eatock, Spencer, 2005), on the other hand, describes a knowledge

[4] Flynn effect – an upward trend in IQ, named after researcher Jamess Flynn, indicating a 3 point increase in IQ value in people in one decade of the 20th century.

worker *as a person who puts into work what he or she learned during systematic education (concepts, ideas, and theories), as opposed to a person who puts into work manual skills or physical strength.* The interpretation of Peter Drucker's definition must take into account the changes that have occurred both in the labor market and in education and training systems since it was first published more than half a century ago.

In view of all this, the question posed by Robert Kelley with regards to the specific organizations or institutions in question remains unanswered. Moreover, the result of such a measurement can form the basis for certain actions aimed at changing training processes, professional development, and the development of knowledge management tools.

In the Polish Armed Forces, following the path of transformation and the example of the Atlantic Alliance, the importance of knowledge is recognized. There is a strong emphasis on meeting the needs of training and intellectual development of soldiers and military employees as the most important resources of the Ministry of National Defence. Members are equipped with numerous knowledge management systems and tools implemented in the internal, departmental, secret ICT network Milnet-Z, which enables mutual contacts and access to appropriate information resources to allow for the effective performance of tasks.

Today's combat environment is characterized by unprecedented dynamics and the saturation of information reaching commanders at all levels from a variety of sources. Additionally, a significant part manifests as so-called information noise. On the one hand, military personnel are equipped with computer systems, analytical tools, and procedures for action in the event of anticipated threats; on the other hand, they operate in a time deficit and under pressure from public opinion (media coverage of the war broadcast live). The high level of automation of command processes introduces unprecedented possibilities to analyze many factors to determine the proper military operations. Another important element is the dynamic development of autonomous technologies widely used in each military branch.

A learning institution which analyses the results of its own activities and draws conclusions from the actions taken (Lessons Learned) employing modern tools aimed at building scenarios of situation development – Strategic Defence Review (foresight) – aims to continuously improve its effectiveness and adapt to dynamic environments. Ever-growing databases, including those which collect conclusions from key elements of military activities, on the one hand, enable quick access to resources, and on the other hand, require the acquisition of additional knowledge and skills related to their handling.

In this extremely broad context, an awareness of how much of the information necessary to perform official duties soldiers and military employees have in their heads is a justified research problem.

2. METHODOLOGY OF CONDUCTING THE DIAGNOSTIC SURVEY

In the **quantitative study** conducted, questionnaires were used which allowed the use of statistical methods[5] both in the field of descriptive statistics and mathematical statistics (Kołodziej, 2013). Taking the above into account, in the conducted survey, a **quotient** (ref.

[5] Statistics – the science of quantitative methods of studying the properties of a population, which deals with the research (collecting, ordering, and analysing) of data about the characteristics of a population.

Bielecka, 2011) **measurement scale** – expressed as a percentage – was used, with a step of 10 percentage points (Table 2).

Table 2. Survey question and adopted measurement scale

How much of the information needed to perform your duties do you have in your head?	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Source: the authors.

Since social sciences usually have finite but very large populations[6], it was necessary to **select an appropriate sample**[7] to ensure its **representativeness**[8]. In this study, all soldiers and employees of the Ministry of National Defence, about 150,000 people, constituted the entire population. Taking into account the **substantive and non-substantive criteria of sample selection**, a **random** (Kołodziej, 2013, pp. 45-46) (probabilistic) sample was obtained to guarantee its representativeness. Surveys in the form of questionnaires were conducted from May 2017 to January 2019, and the analysis of the summaries prepared on the basis of survey **metrics** confirmed the assumptions made above. For example, Table 3 presents the characteristics of respondents in terms of command level and corps, and its graphical representation is shown in Figure 2.

Table 3. Characteristics of respondents in terms of command level and corps

#	**Measure**	**Distribution**					
1	**Command level**	Political and military		Strategic and operational		Tactical	
	Number of respondents	22		83		362	
2	Corps	Navy	Land Forces	Air Force	Special Forces	Territorial Defence Forces	Other
	Number of respondents	41	244	31	25	37	89

Source: authors' findings.

Interpreting the numerical and graphical data, it may be concluded that the respondents served/worked at all levels of command, in all corps, in proportions that reflect the actual division of the Ministry of National Defence. The most numerous were the soldiers and workers of the Land Forces, which are the largest branch of the Armed Forces. According to the proportions of the headcount of the different branches of the military, the smallest group of respondents were Special Forces soldiers, whose actions differed significantly

[6] Population size is the number of statistical units.

[7] A statistical sample is a subset of the statistical units of a population which are directly subjected to statistical observation and which have been specifically selected from the population.

[8] The realization of this postulate absolutely requires the knowledge of the structure of the entire population.

from the range of operational units. The activities of Special Forces are largely based on instinctive reactions to specific tactical situations in the immediate vicinity of enemy forces or resulting from highly secretive activities.

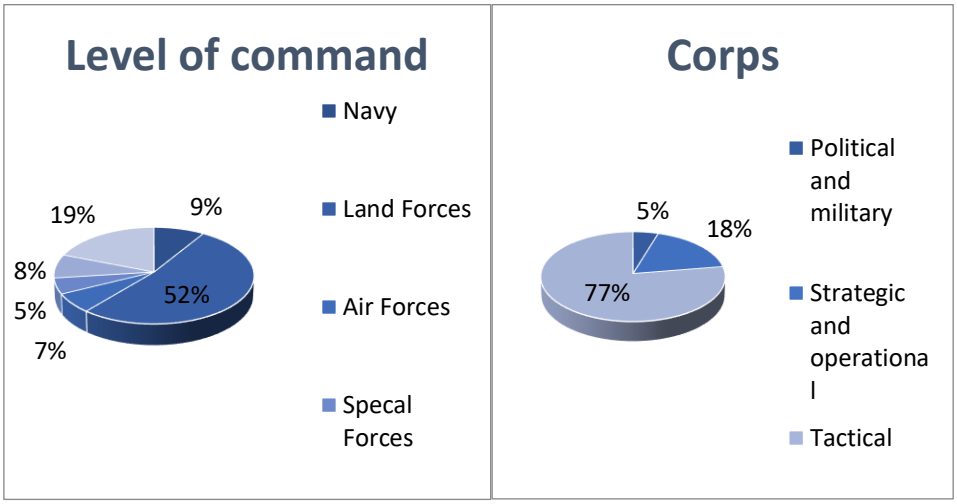

Figure 2. Pie charts presenting the level of command and corps of respondents

Source: authors' findings.

Equally important as the qualitative context described above is the quantitative aspect, i.e. **the minimum sample size**, which guarantees that the maximum estimation error in the study does not exceed *d*, with a confidence level of *1-α*. In the present case, the minimum sample size was determined based on **the estimated average value using the mean**, by sampling without replacement (Zięba, 2012). It therefore depends on the following factors (Kołodziej, 2013):

- **population size** – number of statistical units in the total population – employed in the Ministry of National Defence – about 100,000 soldiers and about 44,000 military workers (Kozubal, 2017);
- **predicted share of the studied phenomenon in the population** – preliminary predictions of the surveyor relating to the measured phenomena. The research is innovative in nature, and it does not refer to other similar or related research, nor has it been preceded by preliminary research. Therefore, in accordance with the methodology of conducting statistical surveys, a value of 50% has been assumed;
- **assumed confidence level –** the value of the confidence level is derived from the components of the measurement result. It is usually assumed as one of three values: 68%, 95%, or 99,9%; in social studies, it is usually p = 95% (α = 0.05) (Babbie, 2007). This indicates a 95% probability that the actual value of the measured parameter is within the specified range of the expanded uncertainty of measurement[9];

[9] However, this does not translate directly into the certainty that any particular obtained interval contains the true value.

- **standard estimation error** - a permissible measurement error that indicates how much the results obtained in a partial test may differ from the actual value in the entire population. Social science studies assume a value of 3%, 5%, or 7%. A standard estimated error of 5% is accepted which is sufficient.

Formula 1 is used to calculate the minimum sample size:

$$n_{min} = \frac{P(1-P)}{\frac{d^2}{z^2} + \frac{P(1-P)}{N}} \qquad \textit{formula 1}$$

where: n_{min} – minimum sample size;
N – entire population size: N = 144 000;
P – predicted share of the studied phenomenon in the population: P = 0.5;
Z – value calculated for the confidence level of 95%: Z = 1.96;
d – standard estimation error: d = 0.05.

Accordingly, the minimum sample size (formula 2) of 384 was calculated.

$$n_{min} = \frac{0.5(1-0.5)}{\frac{0.05^2}{1.96^2} + \frac{0.5(1-0.5)}{144\,000}} = 383.14 \qquad \textit{formula 2}$$

In the survey conducted from May 2017 to January 2019, 467 respondents took part, and the minimum sample size was met.

3. STATISTICAL ANALYSIS

The results of the answer to the question "How much of the information needed to perform your duties do you have in your head?" provided by respondents are summarized in Table 4 and graphically reflected in Figure 3.

Table 4. Frequency distribution of answers to the question "How much of the information needed to perform your duties do you have in your head?"

Value of the characteristic – x_i	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Total
Number of indications – n_i	0	0	15	31	24	89	87	102	79	32	8	467

Source: authors' findings.

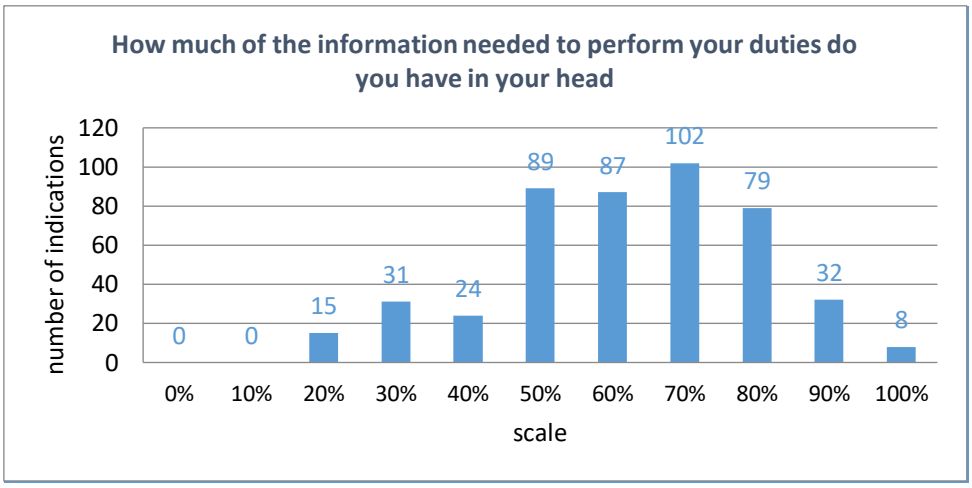

Figure 3. Histogram showing the distribution of answers to the question: "How much of the information needed to perform your duties do you have in your head?"

Source: authors' findings.

Based on the presented data, it can be concluded that the most frequent answer, i.e. given 102 times, was 70%. The next three most frequently chosen answers, 50%, 60%, and 80%, were close to the first one. On the other hand, 0% and 10% were not selected at all. Of the selected answers, respondents chose 100% (8 times) and 20% (15 times) least frequently, at a distance of eight points from each other. A rough analysis of the compiled data shows that there were some slight deviations from the normal standard distribution in the studied distribution. A more detailed analysis requires appropriate calculations and the necessary compilations to enable more precise conclusions to be drawn.

3.1. Measures of central tendency (position)

Arithmetic mean $\bar{x}$ is defined as the quotient of the sum of the value of a measurable characteristic and the number of units of the studied population. In the present case, the calculation of the arithmetic mean will allow the determination of what specific, average value of this characteristic assumes in the sample tested. The arithmetic mean was calculated according to formula 3 (Sobczyk, 2000):

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{k} x_i n_i = \mathbf{0.6210} \qquad \textit{formula } 3$$

where: $\bar{x}$ – arithmetic mean;
x_i – values of the characteristic for i = 1, 2, 3, ..., k;
n_i – number of units adopting the value x_i for i = 1, 2, 3, ..., k;
n – number of all tested units.

Calculating the arithmetic mean of a tested characteristic allows us to state that the **average answer to the question: "How much of the information needed to perform your duties do you have in your head?" was 62.10%.**

The median *M(x)* is a number that divides the population into two parts in such a way that half of the units adopt values less than or equal to the median, and the other half have values greater than or equal to it. An odd number of respondents (467) responded to the questionnaires, which was taken into account during the selection of the relation used to calculate the position of the median – formula 4 (Sobczyk, 2000):

$$\boldsymbol{p_{npa}} = \frac{n_{npa}+1}{2} = \frac{467+1}{2} = \mathbf{234} \qquad \textit{formula 4}$$

where: p_{npa} – median position for an odd number of units;
n_{npa} – odd number of units.

After applying the obtained result to the frequency distribution of answers to the question "How much of the information needed to perform your duties do you have in your head?", the median position was found to be 60% (Table 5).

Table 5. Frequency distribution of answers to the question "How much of the information needed to perform your duties do you have in your head?" with the median highlighted

Value of the characteristic – x_i	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Total
Number of indications – n_i	0	0	15	31	24	89	87	102	79	32	8	467
Median position	234							234				468

Source: authors' findings.

The above results the median to be calculated based on a frequency distribution using formula 5:

$$\boldsymbol{M(x)} = \frac{1}{2}\left(x_p + x_{p+1}\right) = \frac{1}{2}(0.6+0.7) = \mathbf{0.65} \qquad \textit{formula 5}$$

where: $M(x)$ – median (middle value);
x_p – characteristic corresponding to the position of the median p;
x_{p+1} – characteristic corresponding to the position of the median $p+1$.

Calculating the median (middle value) of the tested characteristic allows us to conclude that at least 233 respondents felt that they had 65% or less of the information needed to perform their duties in their heads, and at least 233 respondents felt that they had 65% or more. A simpler interpretation of the median obtained could be as follows: half of the respondents felt that they had 65% or less information needed to perform their duties in their heads, while the other half said that they had 65% or more.

Dominant *D(x)* is the value of the characteristic that occurs most frequently in a given population (this research problem) or with the highest probability. The most frequently

occurring value indicated by respondents was indicated in the distribution (Table 6) (Sobczyk, 2000).

Table 6. Frequency distribution of answers to the question "How much of the information needed to perform your duties do you have in your head?" with the dominant highlighted

Value of the characteristic – x_i	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Total
Number of indications – n_i	0	0	15	31	24	89	87	102	79	32	8	467

Source: authors' findings.

Indication of the dominant (the most common value) of the tested characteristic allows us to conclude that **the most frequent answer to the question: "How much of the information needed to perform your duties do you have in your head" was 70%.**

The $Q_k(x)$ quartiles divide the population into four equal (proportional) 25% portions. Since an odd number of respondents (467) took part in the questionnaire, formulas 6, 7, and 8 were used to calculate the position of quartiles (Sobczyk, 2000).

$$\boldsymbol{p_{k1npa}} = \frac{k_1 \cdot (n_{npa} + 1)}{4} = \frac{1 \cdot (467 + 1)}{4} = \mathbf{117} \qquad \textit{formula 6}$$

$$\boldsymbol{p_{k2npa}} = \frac{k_2 \cdot (n_{npa} + 1)}{4} = \frac{2 \cdot (467 + 1)}{4} = \mathbf{234} \qquad \textit{formula 7}$$

$$\boldsymbol{p_{k3npa}} = \frac{k_3 \cdot (n_{npa} + 1)}{4} = \frac{3 \cdot (467 + 1)}{4} = \mathbf{351} \qquad \textit{formula 8}$$

where: p_{kinpa} – median position for an odd number of units, where i = 1, 2, 3;
k_i – quartile, where i = 1, 2, 3;
n_{npa} – odd number of units.

The obtained results were marked on the frequency distribution (table 7) of answers to the question: "How much of the information needed to perform your duties do you have in your head?"

Table 7. Frequency distribution of answers to the question "How much of the information needed to perform your duties do you have in your head?" with the quartile positions highlighted

Value of the characteristic – x_i	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Total
Number of indications – n_i	0	0	15	31	24	89	87	102	79	32	8	467
Quartile positions	117					117 (234)		117 (351)		117 (468)		468

Source: authors' findings

In view of the above, quartiles were calculated using formulae 9, 10, and 11 based on the frequency distribution.

$$\boldsymbol{Q_{k1}(x)} = x_p + \frac{k_1}{4}(x_{p+1} - x_p) = 0{,}5 + \frac{1}{4}(0{,}6 - 0{,}5) = \mathbf{0{,}525} \qquad \textit{formula 9}$$

$$\boldsymbol{Q_{k2}(x)} = x_p + \frac{k_2}{4}(x_{p+1} - x_p) = 0{,}6 + \frac{2}{4}(0{,}7 - 0{,}6) = \mathbf{0{,}65} \qquad \textit{formula 10}$$

$$\boldsymbol{Q_{k3}(x)} = x_p + \frac{k_3}{4}(x_{p+1} - x_p) = 0{,}8 + \frac{3}{4}(0{,}9 - 0{,}8) = \mathbf{0{,}875} \qquad \textit{formula 11}$$

where: $Q_{ki}(x)$ – quartile, where i = 2, 3, 4;
x_p – value of the characteristic corresponding to the position of the quartile p_{ki};
k_i – quartile, where i = 1, 2, 3, 4;
x_{p+1} – value of the characteristic corresponding to the position of the quartile $p_{ki} + 1$.

The results showed that the first quartile was 52.5%, the second quartile was 65%, and the third quartile was about 87.5%. After comparing the calculated median and quartiles, the second quartile had the same value as the median. Therefore, the interpretation of this result has already been presented before. The fourth quartile, on the other hand, was not subjected to calculations and analysis because it was the quartile that closed the sample. To conclude, the calculation of the values of the second and third quartiles of the tested characteristic allows us to assume that **at least 117 respondents felt that they had 52.5% or less of the information needed to perform their duties in their heads, and at least 117 respondents felt that they had 87.5% or more.**

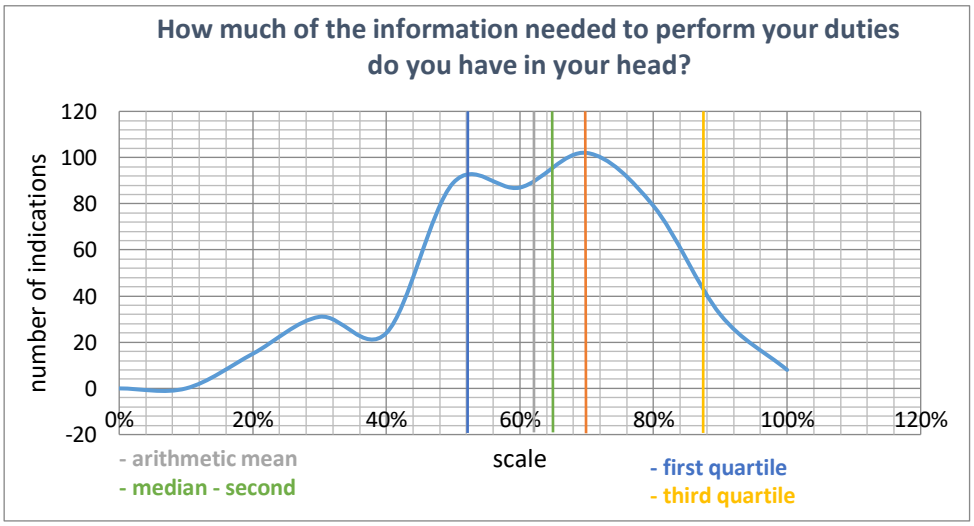

Figure 4. Plot showing the distribution of answers to the question: "How much of the information needed to perform your duties do you have in your head?" with measures of central tendency (position): arithmetic mean, median, quartiles, and dominant

Source: authors' findings.

A simpler interpretation of the quartiles obtained could be as follows: **one-fourth of the respondents felt that they had 52.5% or less information for the performance of their duties in their heads, and one-fourth had 87.5% or more.**

A summary of the conclusions, including measures of central tendency (position), has been presented in graphical form in Figure 4.

3.2. Measures of variability (dispersion), skewness (asymmetry), and kurtosis (concentration)

Calculated measures of variability (dispersion), skewness (asymmetry), and kurtosis (concentration) are necessary to complete the statistical analysis. However, considering that their interpretation in this study is merely complementary, the results of the calculations are presented in Table 8.

Table 8. Results of calculations of statistical measures of respondents' answers to the question "How much of the information needed to perform your duties do you have in your head?"

#	Measure	Result
	Measures of variability (dispersion)	
1.	**Variation $s^2(x)$**	**0.0325**
2.	**Standard deviation $s(x)$**	**0.1803**
3.	**Classical coefficient of variation $V(x)$**	**0.2903**
4.	**Quarterly deviation $Q(x)$**	**0.1750**
5.	**Positional coefficient of variation $V_p(x)$**	**0.2692**
	Measures of skewness (asymmetry)	
6.	**Classical coefficient of asymmetry A(x)**	**-0.3390**
7.	**Positional coefficient of asymmetry $A_p(x)$**	**0.2857**
8.	**Skewness coefficient**	**0.1**
	Measures of kurtosis (concentration)	
9.	**Concentration coefficient $K(x)$**	**2.5455**
10.	**Excess coefficient $g(x)$**	**-0.4545**

Source: authors' findings.

The calculated variance at the level of 0.0325 allows us to state that **there are small differences between the mean and individual results, and the dispersion is small.** A standard deviation of 0.1803 indicates that the **test results deviate on average by 18.03% from the arithmetic mean, which makes it possible to determine that they fall within the typical range of variability and that their spread around the mean is moderately low.** The classical coefficient of variation of 0.2903 allows us to conclude that the **dispersion of distribution is low**. A quarter deviation of 0.175 allows us to conclude that the **deviation of the value of the characteristic from the median among the units from 25% to 75% of the measured characteristic is small**. The positional coefficient of variation was 0.2692, which confirms the conclusion drawn based on the classical coefficient of variation that the **dispersion of distribution is weak - respondents were slightly differentiated in terms of the answer to the question: "How much of the information needed to perform your duties do you have in your head?"**

Taking into account the absolute values of the classical coefficient of asymmetry and positional coefficient of asymmetry, which were 0.3390 and 0.2857 respectively, as well as the positive value of the skewness coefficient equal to 0.1, it can be concluded **that the**

distribution has a very weak right-handed asymmetry. There are slightly more than half of the respondents who, when answering the question "How much of the information needed to perform your duties do you have in your head?" indicated an answer with a value lower than the arithmetic mean.

The interpretation of the results of the concentration coefficient and the negative excess coefficient calculations, which were 2.5455 and -0.4545 respectively, is as follows: **the values of the answer to the question "How much of the information needed to perform your duties do you have in your head?" were less centered around the mean than in a normal distribution, and their line was flatter than that of a normal standard distribution.**

4. SUMMARY

It is worth making a short analysis of what the result of the diagnostic survey indicates, in response to the question "How much of the information needed to perform your duties do you have in your head?" Of course, detailed interpretations of the arithmetic mean $\bar{x}$ (62.1%), the median *M(x)* (65%), the dominant *D(x)* (70%), and the first (52.5%) and third (87.5%) quartiles $Q_k(x)$ were presented over the course of the statistical analysis. On the other hand, some general conclusions can be drawn from them.

First, it should be stressed that the result of this type of study may be very widely considered due to its nature, being both primary (research) and secondary (control). For research, the survey results should be considered in association with the area of operation of an organization. In an organization in which the majority of personnel resources perform their tasks in the materially defined production, in a frontline "battlefield" environment similar to the armed forces, personnel should be expected to have in their heads a significant amount of information necessary to carry out their duties.

The results showed that the vast majority of respondents defined the knowledge in their heads, which is necessary for the performance of their duties, at levels of 50% to 80%. There was a sharp increase in the distribution between the group of respondents estimating the amount of knowledge between 20% – 30% and 50%. The results obtained from most groups showed the need to support the actions taken with the information provided by the outside world. Further questions can be formulated at this point, concerning the self-assessment of soldiers, especially those who indicated in their answers that the range of information in their possession fully covers the demand for the information necessary for the execution of tasks (100%).

Knowledge resources will, of course, be different for soldiers of the general military subdivisions of the Land Forces, for submarine seamen or frigate commanders, and for fighter pilots (specialty). The knowledge resources necessary for effective operations must also be considered from the point of view of the tier and levels of command. There are significant differences between the responsibility of a platoon commander, a company commander, and a division or army commander, which goes hand in hand with their expected amount of knowledge.

Soldiers, and especially commanders, receive more and more information provided in an unprecedented way. The number of sensors and media which overload communication systems with mega-data of different levels of confidentiality is increasing. A soldier, commander, or recipient of such information may easily become reliant on it or, in contrast, begin to ignore it (Latiff, 2018). A kind of dependence on the results of computer systems

calculations may result in the loss of creative thinking and independence in decision-making (Latiff, 2018). This is one of the main threats to effective command.

It is difficult to imagine a worker stopping production, or a soldier stopping combat operations due to a lack of knowledge about what should be done and what should happen next. In such a case, the survey result indicating that respondents have in their heads a negligible percentage of information necessary to perform their duties indicates a need to take action aimed at improving training and professional development processes.

In the case of control, on the other hand, the survey results may indicate whether the introduced knowledge management solutions are effective, whether it is justified to implement further complicated and expensive knowledge management tools, or whether decisions are required concerning a systemic, organizational approach to knowledge management of the rank of, e.g., strategy.

Overall, the results of the presented survey can be seen directly as a measure of a certain statistical characteristic in an organization, and also as an indicator for possible further research and undertaking specific activities – implementing necessary changes in the field of knowledge management.

REFERENCES

Babbie, E. (2007). *Social research in practice*. (*Badania społeczne w praktyce*). Warszawa: Wydawnictwo Naukowe PWN.

Bednarek, A. (2019). *"IQ falls from generation to generation". This is nothing new – old research has been refreshed.* (*"IQ spada z pokolenie na pokolenie". To nic nowego – odświeżono stare badania*) [Access: 18.10.2019]. Access on the internet: tech.wp.pl/iq-spada-z-pokolenie-na-pokolenie-to-nic-nowego-odswiezono-stare-badania-6385495623407745a

Bielecka, A. (2011). *Statistics for managers. Theory and practice*. (*Statystyka dla menedżerów. Teoria i praktyka*). Warszawa: Oficyna Wolters Kluwer Business.

Bontis, N. (2001). *Assessing knowledge assets: a review of the models used to measure intellectual capital. "International Journal of Management Reviews".* Vol. 3 Issue: 1 2001.

Davenport, T. H. (2005). *Thinking for a Living: How to get better performance and results from knowledge workers*. Boston-Massachusetts: Harvard Business School Press.

Elliman, T., Eatock, T., Spencer, N. (2005). *Modelling knowledge worker behaviour in business process studies.* "*Journal of Enterprise Information Management".* Vol. 18 Issue: 1. DOI: 10.1108/17410390510571501.

Goleman, D. (2007). *Business intelligence (Inteligencja biznesowa).* J. Witecka (edit.). *Business volume 1, Company management part 1.* (*Biznes* t. 1, *Zarządzanie firmą* cz. 1). Warszawa: Wydawnictwo Naukowe PWN.

Grygiel, B. (2019). *IQ of humanity is falling. Up to 7 points per generation.* (*Spada IQ ludzkości. Nawet o 7 punktów na pokolenie*) [Access: 18.10.2019]. Access on the internet: www.focus.pl/artykul/spada-iq-ludzkosci-to-bardzo-niepokojace-180613122741

Hawking, S. (2002). *The Universe in a Nutshell*. (*Wszechświat w skorupce orzecha*). Poznań. Zysk i S-ka.

Kołodziej, A. (2013). *Theory of estimation in the practice of social research.* (*Teoria estymacji w praktyce badań społecznych*). Warszawa: Difin.

Kozubal, M. (2017). *Civilian army employees are pariahs of the Ministry of Defense. (Cywilni pracownicy wojska to pariasi resortu obrony).* „*Rzeczypospolita"* [Access: 29.05.2017].

Access on the internet: www.rp.pl/Sluzby-mundurowe/305289919-Cywilni-pracownicy-wojska-to-pariasi-resortu-obrony.html

Latiff, R., H. (2018). *Future War: Preparing for the New Global Battlefield*, (*Wojna przyszłości. W obliczu nowego globalnego pola bitwy*). Warszawa: PWN.

Sobczyk, M. (2000). *Statystyka.* Warszawa: Wydawnictwo Naukowe PWN.

Zięba, A. (2012). *Surveys, parameter estimation, minimum sample size*. (*Badania sondażowe, estymacja parametrów, minimalna liczebność próby*). Warszawa: Wydawnictwo Szkoły Głównej Handlowej [Access: 10.01.2019]. Access on the internet: https://www.e-sgh.pl/niezbednik/plik.php?id=7202&pid=715

DOI: 10.7862/rz.2021.hss.12

The text was submitted to the editorial office: September 2020.
The text was accepted for publication: June 2021.