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The Use of Statistical Methods in Croatian Enterprises During the Early Stages of COVID-19

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Abstract

The appropriate application of statistical methods in enterprises should have an important role in business decision-making processes. However, Croatian enterprises still tend to have certain resistance to statistical methods. The new challenges introduced by the COVID-19 pandemic emphasised the importance of conducting statistical analyses as support for making business decisions. In order to investigate the situation and attitudes towards the use of statistical methods, primary research was conducted in the form of a web survey on a sample of 768 Croatian enterprises, of which 40% use statistical methods in their business. The research revealed the level of statistical methods use in Croatian enterprises, demonstrated which statistical methods Croatian enterprises prefer, and defined who is most responsible for their use. Furthermore, the reasons for the use of statistical methods and the major obstacles to the use of more intensive statistical methods were also investigated. The results are described and discussed on an overall level and by considering the size of the enterprises.

Keywords: Croatian enterprises, use of statistical methods, stratification, web survey

Introduction

The COVID-19 pandemic, which started at the very beginning of 2020, drastically changed the way of life to which the world had been accustomed. The measures introduced in many countries to prevent the spread of COVID-19 had a huge impact on people and their well-being. As a result, people were not only at risk of catching COVID-19 but were/are at risk of various physical and psychological disorders as a consequence of the restrictive measures and constant awareness of the dangers of COVID-19 (Simon et al., 2021). Enterprises have also faced new challenges. The first set of challenges relates to employees, the second relates to doing business with other enterprises, while the third set of challenges are associated with relationships with clients and/or buyers. Of course, the difficulty level of the challenges that an enterprise has to cope with not only differs between enterprises themself but also between countries.

Similar to enterprises in other countries, Croatian enterprises have had to deal with the negative effects of the COVID-19 crisis. However, during the crisis, Croatia was struck by two earthquakes, which resulted in severe material damage and human casualties. Therefore, Croatian enterprises had to deal with two catastrophes at the

same time (OECD, 2021), thus these enterprises needed all the help they could get to overcome these crises.

Statistic methods could be the perfect tool to use to enable easier recovery from the COVID-19 crisis. If they are used in an appropriate way, such methods can offer very important assistance in making business decisions. Consequently, the aim of this paper is to investigate the role of statistical methods in Croatian enterprises. Previous research (Žmuk, 2015, 2018) has shown that roughly only one third of Croatian enterprises use statistical methods in their business as additional help in making appropriate and timely business decisions. To this end, the research demonstrates whether the COVID-19 crisis caused Croatian enterprises to change their opinion and attitude towards statistical methods and their usefulness in business processes. Therefore, the main research hypothesis is that more than one third of Croatian enterprises use statistical methods. This will be investigated at an overall level as well as at the level of enterprises. In addition, various aspects of the statistical methods use in Croatian enterprises will be investigated.

The paper is organised as follows. It begins with an introductory chapter and a brief literature review, followed by a chapter in which the data collection and methodology approaches are described. The third chapter data analyses the data collected and the results obtained from the web survey conducted. The fourth and final chapter contains a conclusion and offers recommendations for future research.

Literature Review

The impact of the COVID-19 crisis on the largest multinational enterprises was investigated by Coeurderoy and Yang (2020). The authors concluded that in the short term, European enterprises could be the main victim due to the deglobalisation processes that started as a response to the COVID-19 crisis. As a follow up to that, De Vet et al. (2021) observed the impact of the COVID-19 crisis on industrial sectors in the countries of the European Union. In order to help industries in their recovery, De Vet et al. (2021) emphasised the importance of the role of governments in introducing appropriate recovery measures.

Siuta-Tokarska (2021) observed the problems and responses of micro-, small- and medium-sized enterprises in Poland during the COVID-19 crisis. The research showed that almost 90% of the observed enterprises reported disruption in their business due to social isolation and changes in customer behaviour. The following were highlighted as the main sources of difficulties: a drop in demand, disruptions in the supply chain, employee leave, quarantine or illnesses of staff, closing of state borders and delays in payments (Siuta-Tokarska, 2021). Problems in the supply chain were declared as the main challenges. The enterprises in Poland responded to those challenges by improving their businesses by introducing the possibility of remote working for their employees. However, the responses of enterprises in Poland to the COVID-19 crisis were negative and resulted in reductions in orders, production and employment (Siuta-Tokarska, 2021).

Cepel et al. (2020) investigated the impact of the COVID-19 crisis on the perception of business risks in the Czech Republic and Slovakia. A comparison of the survey results conducted prior to and during the COVID-19 crisis cited a large increase in the perception of financial risk as the most significant business risk in both countries. In contrast, personnel risk recorded a significant decrease in the share of the most significant business risks.

Roška, Buneta and Papić (2021) indicated that the vast majority of Croatian enterprises think that the COVID-19 crisis will have far more significant consequences than the financial crisis that started in 2008. In addition, 48.6% of enterprises estimated that it will take at least three years to fully recover from the negative impacts of COVID-19, whereas 21.2% of enterprises estimates that they will require five years to recover.

Of course, the COVID-19 pandemic not only affected the members states of the European Union, but also other countries worldwide. To this end, despite the fact that the COVID-19 crisis did not have an impact on some enterprises, the International Labour Organization (2021) found that at least 5% of Indian enterprises had to close their business permanently due to COVID-19.

Sonobe et al. (2021) investigated the impact of the COVID-19 crisis in micro-, small- and medium-sized enterprises in eight Asian countries: Bangladesh, India, Indonesia, Lao PDR, Malaysia, Mongolia, Pakistan and Vietnam. As is the case for enterprises in Poland, the observed Asian countries have also reduced the number of employees and generated lower sales revenues. A particularly interesting finding is that an increase in online sales tends to have negative impact on the employment level (Sonobe et al., 2021).

According to Dai et al. (2020), enterprises in China had to deal with lack of demand due to COVID-19. In addition, there were major problems in supply chains. It turned out that export-oriented enterprises were more hit by the COVID-19 crisis than those whose businesses are not based on export.

The Economic Commission for Latin America and the Caribbean (2020) emphasised the negative impact of the

COVID-19 crisis on the countries of Latin America and the Caribbean. According to the report, COVID-19 had the biggest impact on enterprises whose weaknesses and problems in business were already present over the long term. Over a third of employees were employed in enterprises which were heavily hit by the COVID-19 crisis. Additionally, due to reduced income, consumers lowered their consumption and changed their consumption habits. Although many enterprises will close their business permanently as a result of the COVID-19 crisis impact, the Economic Commission for Latin America and the Caribbean (2020) concluded that the impact of the COVID-19 crisis can differ greatly depending on the type and the sector of enterprise.

Oyewale, Adebayo and Kehinde (2020) compared the effects of the COVID-19 crisis on enterprises from the Nigerian agricultural and non-agricultural sectors. In addition, the authors investigated the impact of lockdowns and other measures on the enterprises from both sectors. They demonstrated that lockdown measures have a negative impact on sales, which was more pronounced among enterprises from the non-agricultural sector (Oyewale, Adebayo & Kehinde, 2020).

Methodology

Data and sample

Due to the General Data Protection Regulation (GDPR) (Intersoft consulting services, 2021) it can be difficult to obtain a sampling frame that can be used in web surveys. Administrative sources that contain a lot of important information about enterprises, which are confirmed as accurate, are tending to reduce the amount of information that they make public. Information relating to the e-mail address of enterprises, which is crucial in conducting web surveys, is often omitted. In order to overcome this problem, a compromise was made and an older version of the sampling frame from the end of 2016 was used in this business web survey. This means that new enterprises that were established in or after 2017 were not included in the survey. This could be considered as a limitation of the research. However, enterprises with four or more years of active business and experience took part in the web survey, meaning that these enterprises were able to provide better insights into, and share well justified thoughts about, the statistical methods used in their business processes due to the fact that they already have established procedures and processes.

Considering the main limitation of the sampling frame, which is not completely up to date as it is four years old, the Register of business entities in Croatia, led by the Croatian Chamber of Commerce (2021), was used to collect the necessary information about enterprises. For the purpose of this, research, only joint stock enterprises, limited liability enterprises and simple limited liability enterprises that are registered in Croatia were observed. According to the sampling frame, there were 721 joint stock enterprises, 35,643 limited liability enterprises and 1,495 simple limited liability enterprises. From a total of 37,859 enterprises in the sampling frame, there were 335 large enterprises, 1,134 medium-sized enterprises and 36,390 small and micro enterprises.

Due to the fact that the sampling frame used is not up to date, the authors of this research decided to contact all the enterprises listed. They believed that doing so would compensate for the inability to select new enterprises that were established four years ago or less. This is also a corrective measure for differences that could appear from the time when the sampling frame was created and when the web survey began. For example, in the meantime, enterprises could have changed their e-mail addresses and consequently would not be able to participate in the web survey. Additional reasons for contacting all the enterprises from the sampling frame can be found in previous research, which has shown quite low response rates in business web surveys in Croatia (Žmuk, 2015, 2018).

The authors began the web survey by sending an invitation to take part in the survey to the e-mail address of enterprises in the sampling frame on Friday 25 September 2020. From the 37,859 enterprises contacted, an error message was returned in 4,817 cases. Therefore, it was impossible to deliver an invitation email to take part in the web survey to 12.72% of enterprises from the sampling frame because, in most cases, the e-mail address was no longer active or the e-mail inbox size limit had been reached. It must be emphasised that it was impossible to deliver e-mails to 3,885 (10.26%) of enterprises from the sampling frame, even when the sampling frame was up to date at the end of 2016. Hence, the increase in the number of enterprises that did not receive the web survey invitation was lower than expected, which leads to the conclusion that the sampling frame used can still, even after four years, be considered usable.

The web survey closed on Thursday 31 December 2020. In the meantime, two reminders were sent. The first was sent on Tuesday 27 October 2020, while the second was sent on Wednesday 25 November, 2020.

A total of 2,125 enterprises took part in the web survey. Unfortunately, this figure does not reflect the number of fully completed questionnaires. Of this figure, 1,357 (64%) of the questionnaires were not fully completed, therefore such questionnaires will be omitted from further analysis. A total of 768 fully completed questionnaires were received, which

will be observed in the further analysis. A response rate 1 (American Association for Public Opinion Research, 2016) of 2.32% was achieved.

Research instrument

The topic of the questionnaire was the use of statistical methods in Croatian enterprises. Therefore, the first question in the questionnaire was a filter question to distinguish between enterprises that apply statistical methods in their business and those that prefer not to use such methods. Depending on the answer to the filter question, the enterprises were sent different sets of questions. Consequently, the questionnaire for enterprises that use statistical methods was longer than that for enterprises that do not use them. According to the collected paradata, enterprises that use statistical methods took an average of 10.76 minutes to complete the questionnaire, whereas those that do not use statistical methods took an average of 5.69 minutes to complete their version of the questionnaire.

Table 1. Detrended Fluctuation Analysis (DFA)

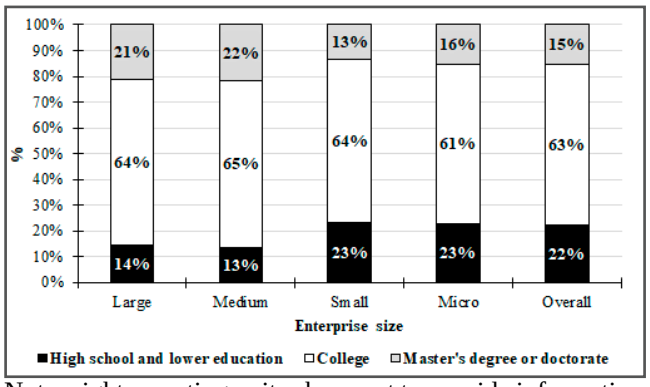
Size of enterprise	Reporting units		
	Gender	Number	Average work experience in years
Large	Male	8	24.50
	Female	6	20.33
	Total	14	22.71
Medium	Male	32	26.09
	Female	29	19.97
	Total	61	23.18
Small	Male	134	24.84
	Female	119	23.12
	Total	253	24.03
Micro	Male	255	27.38
	Female	185	23.15
	Total	440	25.60
Overall	Male	429	26.43
	Female	339	22.81
	Total	768	24.84

Source: Author

Table 1 shows both the number of participating enterprises in the web survey according to their size as well as the number of reporting units according to their gender and average work experience. As expected, the highest share in the sample are small and micro enterprises (combined 90%), whereas large enterprises only account for a 2% share in the sample. Regardless of the size of the enterprise, more males than female reporting units filled out the survey questionnaire. A total of 56% male and 44% female participants took part in the web survey as reporting units for the enterprises where they work. Considering the average work experience of the reporting units, it can be concluded that the reporting units have a significant amount of experience, with average work experience of almost 25 years. This result is quite remarkable and should ensure that the answers provided are of high quality based on previous extensive business experience.

Figure 1 reveals the structure of reporting units according to the highest achieved education level. According to Figure 1, of the survey participants, 78% are highly educated, whereas 22% of the share of reporting units have a college or lower level of education. The share of reporting units with college education is fairly level across all the enterprises sizes, whereas the share of reporting units with a master's or doctoral degree is higher in medium- and large-sized enterprises than in micro- and small-sized enterprises.

Figure 1. The number of reporting units according to gender and average work experience



Note: eight reporting units chose not to provide information about the highest achieved education level.
Source: Author

Statistical Analysis

In the analysis, the main focus is on the answers provided by enterprises that use statistical methods. The answers were observed and compared at an overall level and between different sizes of enterprises. The analysis alone is based on descriptive statistics methods which point out the situation relating to the use of statistical methods in the enterprises in the sample. The results of the descriptive methods, meanwhile, will make a good base for future in-depth analyses and conclusions about the entire population of Croatian enterprises.

Results

A total of 768 enterprises took part in the survey by completing the questionnaire and their answers were then analysed. The first survey question asked enterprises to state whether they use any statistical methods in their business. The responses, shown according to the size of the enterprise, are shown in Table 2 and Figure 2.

As can be seen in Table 2 and Figure 2, only 40% of the enterprises in the sample use statistical methods in their business. The lowest figure is among micro enterprises, where among the 440 enterprises in the sample, only 135 (31%) use statistical methods. Approximately the same number of small enterprises in the sample use and do not use statistical methods. In contrast, statistical methods are convincingly used the most in the large enterprises. Only one (7%) large enterprise did not seem to use statistical methods.

The results shown in Table 2 and Figure 2 suggest that the bigger the enterprise, the more likely it is that statistical methods are used. One of the reasons for such a situation lies in the fact that the increase in enterprises also means an increase in the complexity of their business processes. Motivation for whether or not to use statistical methods will be analysed in detail later in this paper.

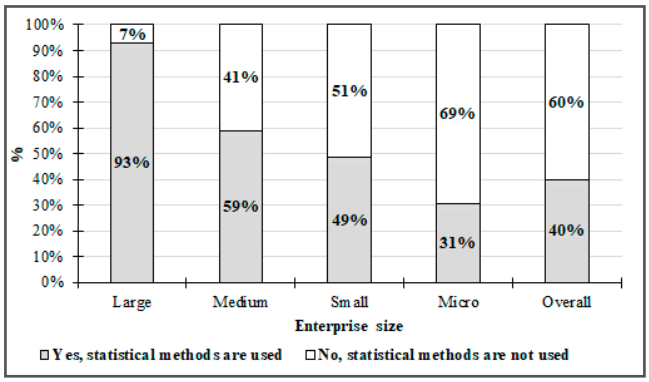
The focus in the following tables and figures is on those enterprises that use statistical methods. Thus, Table 3 illustrates the frequency of the use of certain statistical methods

Table 2. The number of enterprises in the sample according to whether statistical methods are used

Size of enterprise	Use of statistical methods		Total
	Yes	No	
Large	13	1	14
Medium	36	25	61
Small	123	130	253
Micro	135	305	440
Overall	307	461	768

Source: Author

Figure 2. The share of enterprises in the sample according to whether statistical methods are used



Source: Author

Table 3. Frequency of the use of chosen statistical methods in Croatian enterprises in the sample, n=307

	Frequency of use					
Statistical method	Every day	Weekly	Monthly	Yearly	Less than once a year	Never
Descriptive statistics	7%	8%	21%	17%	3%	44%
Outlier detection	4%	7%	20%	12%	4%	53%
Inferential statistics	2%	2%	10%	13%	6%	67%
Survey methods	8%	8%	24%	18%	7%	35%
Multivariate methods	3%	3%	10%	14%	7%	63%
Design of experiment	1%	2%	8%	10%	7%	71%
Statistical process control	7%	7%	25%	13%	5%	42%
Acceptance sampling	4%	4%	16%	13%	7%	57%
Naive forecast models	4%	4%	11%	13%	7%	61%
Smoothing methods	0%	3%	8%	11%	5%	72%
Regression models	1%	3%	9%	12%	6%	69%

Source: Author

Table 4. Frequency of the use of chosen statistical methods in Croatian enterprises in the sample according to their size, n=307

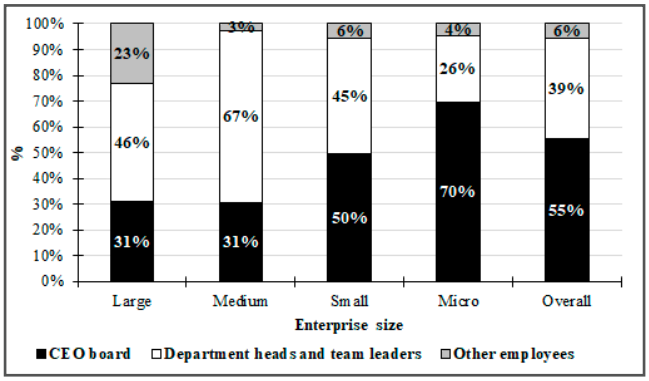
Statistical method	Frequency of use						
	Enterprise size	Every day	Weekly	Monthly	Yearly	Less than once a year	Never
Descriptive statistics	Large	23%	8%	46%	8%	0%	15%
	Medium	11%	6%	19%	14%	6%	44%
	Small	7%	7%	26%	14%	2%	44%
	Micro	5%	9%	16%	21%	3%	46%
Outlier detection	Large	15%	46%	31%	8%	0%	0%
	Medium	6%	3%	28%	19%	0%	44%
	Small	3%	6%	20%	11%	5%	54%
	Micro	4%	5%	17%	10%	4%	59%
Inferential statistics	Large	15%	0%	38%	15%	8%	23%
	Medium	0%	3%	3%	25%	8%	61%
	Small	1%	3%	9%	14%	7%	66%
	Micro	2%	0%	11%	10%	3%	74%
Survey methods	Large	23%	23%	31%	8%	0%	15%
	Medium	8%	11%	28%	17%	3%	33%
	Small	7%	7%	29%	20%	8%	28%
	Micro	7%	6%	18%	17%	9%	43%
Multivariate methods	Large	15%	0%	23%	15%	0%	46%
	Medium	3%	0%	19%	14%	3%	61%
	Small	2%	3%	11%	15%	8%	61%
	Micro	3%	3%	7%	13%	7%	67%
Design of experiment	Large	8%	8%	31%	8%	0%	46%
	Medium	0%	3%	8%	14%	8%	67%
	Small	0%	2%	8%	9%	10%	72%
	Micro	2%	1%	6%	10%	6%	75%
Statistical process control	Large	31%	15%	38%	8%	0%	8%
	Medium	11%	14%	31%	17%	3%	25%
	Small	6%	7%	28%	9%	6%	45%
	Micro	6%	6%	20%	17%	4%	47%
Acceptance sampling	Large	0%	8%	38%	23%	0%	31%
	Medium	3%	0%	33%	17%	6%	42%
	Small	3%	3%	14%	12%	10%	58%
	Micro	5%	5%	10%	11%	4%	64%
Naive forecast models	Large	0%	0%	23%	31%	0%	46%
	Medium	6%	3%	8%	11%	11%	61%
	Small	2%	6%	11%	14%	10%	57%
	Micro	5%	3%	11%	12%	3%	66%

Table 4. Frequency of the use of chosen statistical methods in Croatian enterprises in the sample according to their size, n=307 (continued)

Statistical method	Frequency of use						
	Enterprise size	Every day	Weekly	Monthly	Yearly	Less than once a year	Never
Smoothing methods	Large	8%	0%	31%	15%	0%	46%
	Medium	0%	6%	6%	17%	6%	67%
	Small	0%	2%	10%	8%	7%	73%
	Micro	0%	4%	6%	13%	3%	75%
Regression models	Large	8%	0%	15%	15%	0%	62%
	Medium	0%	0%	22%	11%	6%	61%
	Small	2%	3%	9%	12%	7%	67%
	Micro	0%	3%	5%	13%	5%	74%

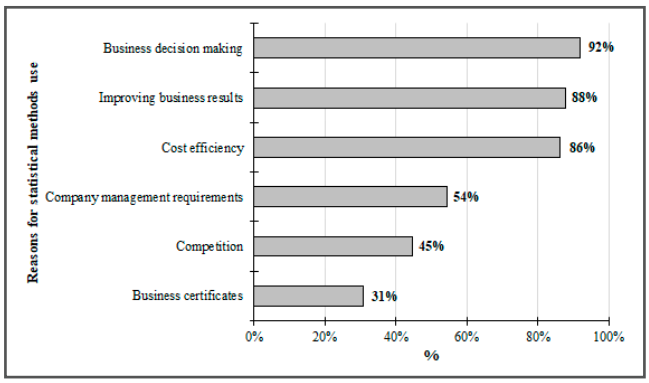
Note: the highest percentages of each observed statistical method and each frequency of shown in bold.
Source: Author

Figure 3. The share of employees that use statistical methods the most in Croatian enterprises in the sample according to their hierarchical level, n=307



Source: Author

Figure 4. The reasons for the use of statistical methods in the Croatian enterprises in the sample, n=307



Source: Author

in enterprises. Logically, the results in Table 3 only include enterprises in the sample – 307 of them – that confirmed that they use statistical methods. A total of 11 different statistical methods groups are recognised and listed. It is surprising that descriptive statistics methods, which tend to be observed as the simplest and most basic groups of statistical methods, are not the most frequently used in Croatian enterprises. As can be seen in Table 3, the most frequently used group of statistical methods are survey methods which are applied on a daily basis in 8% of enterprises. Survey methods are never used in 35% of enterprises that use statistical methods in their businesses. The next statistical method in the ranking, based on the share of enterprises that have never used a certain statistical method group, is statistical process control, which is not used in 42% of Croatian enterprises that use statistical methods. Survey methods and statistical process control are closely followed by descriptive statistics methods, which are not used in 44% of Croatian enterprises that use statistical methods.

Table 3 reveals that the rates of Croatian enterprises that have never applied certain statistical methods are quite high ranging from 35% to 72%. This leads to the conclusion that Croatian enterprises use a narrow number of statistical method groups according to their specific business needs.

Table 4 illustrates the frequency of the use of certain statistical methods in enterprises according to their size. The results in Table 4 are consistent with those relating to the use of statistical methods, wherein a higher share of larger enterprises tend to use statistical methods than smaller enterprises. Almost all the observed statistical methods are the most frequently used by large enterprises, whereas micro enterprises account for the highest share of enterprises that

have never used certain statistical method groups in all the observed statistical method groups.

In general, among all enterprise sizes, the least often used groups of statistical methods turned out to be those that seem to be more complex in their application than other statistical method groups or those that relate more to certain kinds of enterprises. Such groups of statistical methods are multivariate methods, design of experiments, smoothing methods or regression modelling.

Figure 3 illustrates the structure of employees in the enterprises that most use statistical methods. It was expected that in the smaller enterprises, CEO boards would be the main users of statistical methods, whereas employees at a lower hierarchical level in the larger enterprises would be most engaged in the use of statistical methods. The survey results, however, revealed quite the opposite situation. According to the results, only in 4% of micro and 6% of small enterprises are CEOs most responsible for the use of statistical methods. In contrast, CEOs play a main role in the use of statistical methods in 23% of large enterprises.

Table 5. The reasons for the use of statistical methods in Croatian enterprises in the sample, according to enterprise size, n=307

Reasons for the use of statistical methods	Enterprise size			
	Large	Medium	Small	Micro
Business decision making	92%	92%	92%	92%
Improving business results	92%	92%	87%	87%
Cost efficiency	92%	86%	87%	85%
Company management requirements	85%	53%	57%	50%
Competition	46%	61%	43%	41%
Business certificates	54%	36%	34%	24%

Source: Author

If Croatian enterprises were asked what the main reasons are for using statistical methods, according to the survey results illustrated in Figure 4, they would convincingly agree that the most important reasons are improving the business decision-making process, improving business results and increasing cost the efficiency of the enterprise. The choice of these reasons confirmed that the vast majority of Croatian enterprises recognised the true reasons why statistical methods should be used in the first place. Convincingly, the least important reason for the use of statistical methods in enterprises is the situation where the use of statistical methods was a prerequisite in the process of getting certain business certificates.

Table 5 lists the reasons for the use of statistical method in Croatian enterprises according to their size. The more detailed results confirmed that the three reasons (business decision-making process, improving business results and increased cost efficiency of the enterprise) are the main reasons for the use of statistical methods for enterprises of all sizes. However, in terms of large enterprises, another important reason for the use of statistical methods is a requirement by management. This result is in line with previous results which have shown that in large enterprises, there is unexpectedly high share of CEOs who are responsible for the use of statistical methods. Competition, as a reason for the use of statistical methods, is the most emphasised in medium-sized enterprises. In more than a half of the large enterprises, the need to obtain a certain business certificate was also cited among the reasons for use of statistical methods.

Table 6 further defines the causes of obstacles that prevent the greater use of statistical methods to the level of enterprises according to their size. In general, among enterprises of all sizes, the main obstacles are confirmed to be insufficient knowledge of statistical methods and employees already being overloaded with other jobs and work-related tasks. However, in large enterprises, it is clear that the problem is a lack of staff who could apply statistical methods. Therefore, in large enterprises the problem is not only related to not knowing enough about statistical methods but also due to a lack of employees who could apply statistical methods. It seems that the bigger the size of the enterprise, the less financial resources present a limit to the greater use of statistical methods. However, almost half of micro enterprises stated that a lack of financial resources is a major obstacle preventing the greater use of statistical methods.

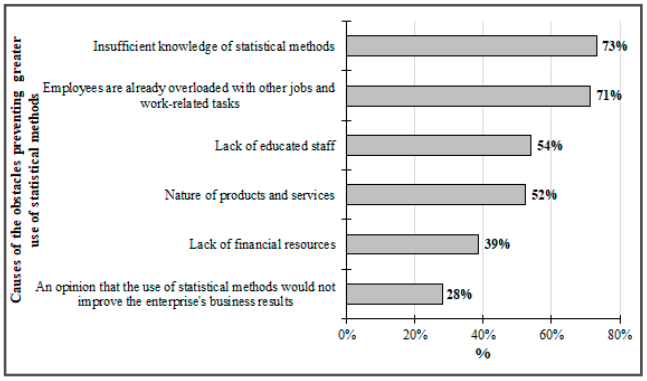
Whereas the enterprises that use statistical methods were asked about the causes of obstacles that prevent the greater use of statistical methods, the enterprises that do not use statistical methods at all were asked why they do not use them. Figure 6 shows the share of enterprises that cited the reasons for not applying statistical methods. The first notable statistic is the fact that the differences in levels between the various reasons for not applying statistical methods are not as great as the differences in the causes of obstacles that prevent the greater use of statistical methods. This means that those enterprises that do not use statistical methods tend to have a larger number of reasons for not applying such methods. The main reason for not applying statistical methods is employees already being overloaded with other jobs and work-related tasks. The result showing that half of the enterprises that do not use statistical methods

Table 6. The causes of obstacles that prevent the greater use of statistical methods in Croatian enterprises in the sample, according to enterprise size, n=307

Causes of obstacles that prevent greater use of statistical methods	Enterprise size			
	Large	Medium	Small	Micro
Insufficient knowledge of statistical methods	100%	75%	68%	75%
Employees are already overloaded with other jobs and work-related tasks	69%	67%	70%	74%
Lack of educated staff	77%	53%	54%	52%
Nature of products and services	46%	47%	47%	59%
Lack of financial resources	23%	31%	33%	47%
An opinion that the use of statistical methods would not improve the enterprise's business results	31%	28%	31%	25%

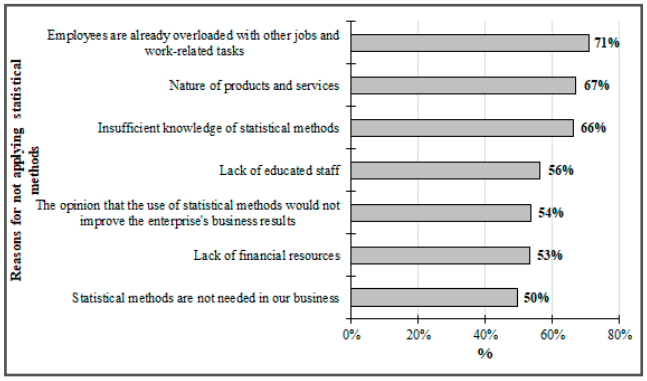
Source: Author

Figure 5. The causes of obstacles preventing the greater use of statistical methods in Croatian enterprises in the sample, n=307



Source: Author

Figure 6. The reasons for not applying statistical methods in Croatian enterprises in the sample, n=461



Source: Author

Table 7. The reasons for not applying statistical methods in Croatian enterprises in the sample, according to enterprise size, n=461

Reasons for not applying statistical methods	Enterprise size			
	Large	Medium	Small	Micro
Employees already overloaded with other jobs and work-related tasks	100%	52%	75%	71%
Nature of products and services	0%	64%	64%	69%
Insufficient knowledge of statistical methods	100%	56%	72%	65%
Lack of educated staff	100%	36%	62%	56%
The opinion that the use of statistical methods would not improve the enterprise's business results	100%	72%	49%	54%
Lack of financial resources	0%	32%	57%	53%
Statistical methods are not needed in our business	0%	56%	43%	52%

Source: Author

think that they do not need such methods in their business is very concerning.

In Table 7 the reasons are shown, according to size, for why those enterprises that do not use statistical methods at all do not apply them. It must be emphasised that there was only one large enterprise in the sample that did not use statistical methods, therefore the results shown for large enterprises are not representative. An interesting finding is that the opinion that the use of statistical methods would not affect the enterprise's business results is the main reason for not applying statistical methods in medium-sized enterprises, whereas a lack of financial resources is the least significant reason among these enterprises. In contrast, in micro and small enterprises the main reason for not applying statistical methods is that employees are already overloaded with other jobs and work-related tasks. The lowest share of micro and small enterprises stated that the reason statistical methods are not needed in their business is one of the reasons why they do not use such methods.

Discussion

The results of the survey conducted produced some very interesting findings. First, it showed that 40% of the enterprises that took part use statistical methods in their business processes and in decision-making. Thus, the research hypotheses that more than one third of Croatian enterprises use statistical methods can be accepted (p-value<0.0001). In addition, this conclusion is valid for large (p-value<0.0001), medium (p-value<0.0001) and small (p-value<0.0001) enterprises. However, the results illustrated that less than one third of Croatian micro enterprises use statistical methods (p-value=0.8810). Based on these results, it can be concluded that enterprises have additionally recognised the importance of the use of statistical methods as a supportive tool for improving their business processes and for combatting the negative effects of the COVID-19 pandemic.

Interesting results were obtained when the frequency of the use of certain statistical methods is observed. Survey methods and statistical process control methods are the most frequently used. It was expected that descriptive statistic methods, being the most straightforward and easiest way to apply statistical methods, would be the most frequently used, however, the results showed that, surprisingly, they ranked in third place according to the frequency of their use. These results could suggest that enterprises are going beyond basics and starting to use more advanced statistical methods that are most appropriate for their business. This is especially the case in larger enterprises whereas small enterprises are still struggling with the basic statistical methods.

The results illustrate that in more than 50% of the surveyed enterprises that use statistical methods, it is the members of the CEO board who most use these methods in Croatian enterprises. It was expected that this share would decrease in line with the increase in the size of the enterprise, however, the results show that the share of members of the CEO board who use statistical methods the most in Croatian enterprises is 31% for both large and medium enterprises.

The main reasons for the use of statistical methods in Croatian enterprises are business decision-making, improving business results and cost efficiency. The importance of those reasons is at the same level for enterprises of all sizes. Similarly, the most important cause of obstacles that prevent the greater use of statistical methods is insufficient knowledge of statistical methods. This would explain why enterprises stick to the use of simpler statistical methods.

Conclusions

The COVID-19 crisis is the most recent crisis to have threatened both the general population and enterprises to the same extent. Undoubtedly the crisis has presented all enterprises with a serious challenge. Statistical methods could be a very helpful tool to make dealing with the COVID-19 crisis itself easier, as well as other related challenges.

However, the web survey conducted on a representative sample of Croatian enterprises showed that only 40% of enterprises use statistical methods in their business (Žmuk, 2018). Nevertheless, it is an increase, albeit slight, in comparison to the previous research conducted prior to the start of the COVID-19 crisis. In addition, the fact that enterprises have started to recognise the role and importance of the use of statistical methods in decision-making is encouraging. Therefore, a further increase of the importance of the use of statistical methods in Croatian enterprises is expected.

However, more work needs to be done on educating managers about the importance and possibilities of the use of statistical methods in business decision-making. There are some positive changes in the attitude towards the acceptance of statistical methods in Croatian enterprises, which, for example, is reflected in the increased share of enterprises that use statistical methods, however, these changes are too slow and too few.

The limitation of the research can be found in the fact that there are too few enterprises with certain characteristics (such as large enterprises). Furthermore, in such web surveys, a question that is always raised is whether the questionnaire was completed by the most competent person

in an enterprise or whether it was delegated to a member of the technical staff who may not have a sufficient level of information and may not see the full picture about the observed topic in the questionnaire. Therefore, in addition to web surveys, the authors of this paper recommend that other additional and supportive survey modes, such as CATI, are applied. However, that would require more financial resources to be made available for such research.

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Uporaba statističnih metod v hrvaških podjetjih v zgodnji dobi covida-19

Izvleček

Ustrezna uporaba statističnih metod v podjetjih bi morala igrati pomembno vlogo v procesih poslovnega odločanja. Vendar pa se hrvaška podjetja statističnim metodam do določene mere še vedno upirajo. Novi izzivi, ki jih je prinesla pandemija covida-19, so poudarili pomen izvajanja statističnih analiz kot podpore pri sprejemanju poslovnih odločitev. Za preučitev stanja in odnosa podjetij do uporabe statističnih metod je bila izvedena primarna raziskava v obliki spletne raziskave na vzorcu 768 hrvaških podjetij. Ugotovili smo, da jih 40 % pri svojem poslovanju uporablja statistične metode. Raziskava je pokazala raven uporabe statističnih metod v hrvaških podjetjih in hkrati predstavila statistične metode, ki so v hrvaških podjetjih zaželene in kdo je najbolj odgovoren za njihovo uporabo. Analizirali smo vzroke za uporabo statističnih metod in glavne ovire, ki preprečujejo njihovo intenzivnejšo uporabo. Rezultati so predstavljeni in obravnavani na splošni ravni in ob upoštevanju velikosti podjetij.

Ključne besede: hrvaška podjetja, uporaba statističnih metod, stratifikacija, spletna raziskava