

THE ROLE OF STATISTICS IN KOSOVO ENTERPRISES

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Abstract: *Considering science as the main contributor to contemporary developments has encouraged us to raise a scientific discussion regarding the role of statistics in business decision-making and economic development. Statistics, as an applicative science, is growing and being widely applied in different fields and professions. Statistical thinking is becoming a daily necessity in enterprises.*

The main purpose of this survey was to ascertain in what levels main enterprise managers in Kosovo are using statistical methods in their business decision-making. For this purpose 85 managers of the main companies in Kosovo have been interviewed. The analysis of the gathered data was performed by Chi-Square Test, Asymp.Sig(2 sided) and Cramer's V. These analyses comprise the central focus of this survey. The data was processed by Statistical Program for Social Sciences (SPSS). Statistical approach and methodology used in this research has made it easier for us to draw conclusions and recommendations.

Key words: *decision-making; variable analysis; Chi-Square Test; statistical software; Kosovo*

1. Introduction

Rapid changes and global economic interdependence require quick adjustment of national economies and global integration trends (Galen C. Britz at all. 1999, Hannele Orjala. 2006.). The role of statistics in all this process was somehow underestimated (John and Johnson 2002). The right reading and interpretation of results from many statistical analyses (Neil J. Salking 2004), is important in the process of economic decision-making.

The main purpose of this survey was to find out the level of knowledge and application of statistical methods from the main enterprise managers in Kosovo in the process of business decision-making. Making right decisions and on time requires from the enterprise managers to possess basic knowledge of statistical methods and statistical thinking in general. In view of work place creation, Gross Domestic Product (GDP) and the value of assets² the examined enterprises comprise the main enterprises in Kosovo. Based on activity criterion the highest number of examined enterprises belongs to industrial sector, following than by service, agricultural and commercial sector. Considering juridical status, two thirds of them are private while the rest are public enterprises.

The interviewed managers represent roughly all working sectors within the enterprise, providing us with full view of used statistical methods in the enterprise as well with the variation of the methods used according to working sectors.

2. Research methodology

The main objectives of this study were to determine:

- Whether managers of Kosovo Enterprises are familiarized and utilize statistical methods in the decision making.
- An increase within the awareness of managerial staff in Kosovo enterprises for the role of statistics in business decisions.

This paper is focused on the responses of five key questions to conduct statistical analysis. These questions are:

1. Do managers of Kosovo enterprises know and use statistical methods?
2. What number of statistical trainings has she/he had as manager in enterprises?
3. Is there a need for new knowledge and training of staff in statistics field?
4. What are the common statistical methods used by managers in the business decisions?
5. What is the common statistical software used by managers to conduct statistical analysis?

A questionnaire was designed by the researchers and used as an instrument for gathering data. Field work was implemented in the period 1-22 February 2008 by Master students of Agro-economy Department³. A list of enterprises obtained by Ministry of Trade and Industry is used for determination of the sample size, while the number of workers has been used as criterion for the selection of units. The target population was managerial staff of small, medium and large enterprises with number of workers more than 10.

According to the Ministry of Trade and Industry the total number of enterprises in 2007 was 59156, where 98.25% or 58113 were micro enterprises with number of workers from 1 to 9, whereas 1.75 % or 1043 belongs to small, medium and large enterprises. To

obtain a sample of units from a population of size $N = 1043$, firstly we numbered population units from 1 to 1043, than every twelfth unit was drawn from the list to be included in a sample.

The data used in this study comes from interviews realized with $n = 85$ enterprise managers. Within 85 enterprise managers included in the sample size 40% of interviewed managers come from industrial sector, 22.2% service sector, 15.3% agricultural sector, 11.8% commercial sector while the rest 10.7% belongs to other sectors such as Post Telephone & Transport and financial sector. The managers' opinion was taken for the level of statistical knowledge, methods and software (s) used and their awareness for the role of statistics in the process of business decisions making. Moreover an attempt was made to clarify the link between the managers' age, gender, level of education, working experience, sector, level of management and number of trainings with acquaintances and usefulness of statistical methods and software (s). The questions were construed in consistence with the nature of the research, with the possibility to gather data and to give real evaluations for the level of knowledge and execution of statistics in the economy.

Statistical Program for Social Sciences (SPSS) has been used as a tool for entering and processing of data. Variables which have been created in this research were measured at various levels such as: nominal, ordinal, and scale. For example, with nominal level as the lowest one was measured activity of enterprise, manager's gender, sector where he/she works, statistical methods and software(s) that he/she use in his/her work. With ordinal and scale levels were measured variables as manager's age, level of education, working experience, level of management and their needs for more statistical knowledge. Tests like Chi-Square test, Asymp.Sig (2 sided) and Cramer's V were used for the assessment of significance variables.

3. Literature review

About the importance of statistics in the process of business decision-making many authors in many studies (C.J. Wild and M. Pfannkuch. 1999, Maxine Pfannkuch and Chris Wild 2002, Carol Anne Hargreaves.2002), state that enterprises and their managers with different characteristics have different knowledge, tendency and willingness to execute statistical methods in the process of decision-making to go further without data, and each of them is "an expert" but there can hardly be achieved any reconcilability and progress in solving specific problems without basic statistical knowledge.

There is a wide belief that statistics helps the enterprise management in the process of decision-making, decreasing insecurities and risks being always based on data and not on personal opinions and certainties (Luigi Bigeri. 2004). Referring to Professor Jelf Timmons from Harvard, Ivo Vajic, 1994, Page 82, enterprise managements should have "helicopter brain" and skills that enable them to quickly adjust to changes.

Some authors in their studies point out that not every time all the managers accept the role of statistics in the right way in making important decisions in economy (John and Johnson, 2000); (Brian S.Yandell, 1997). Another not very small number go further to find out that statistics is not much needed in their jobs, considering it as technique rather than a possibility to create new values and a way to minimize risks (Galen C. Britz, 1999).

4. Presentation of hypotheses

The main hypotheses tested in this study were, if there is dependency between the level of knowledge and usefulness of statistical methods with regard to:

- a) Enterprise characteristics
- b) Manager characteristics

In order to make the data analyses easier, the independent variables were segregated into three groups. The first group of independent variables consists of enterprise characteristics such as activity of enterprise, juridical status, level of responsibilities, and the manner of decision-making in enterprise. The intention was to test the hypotheses, whether the level of knowledge and usefulness of statistics in enterprises depends on its characteristics.

Hypothesis1. The managers of industrial and service enterprises know and execute statistical methods at a greater extent as compared to the managers of agricultural enterprises, when making important decisions.

Hypothesis2. Managers of public enterprises compared to those of the private ones have more tendencies to know and to execute statistical methods.

Hypothesis3. Managers of joint-stock-companies know and execute statistical methods more in analyses and forecasts because of the higher responsibilities they have.

Hypothesis4. Managers of enterprises which make decisions collectively have more tendencies to know and to execute statistical methods compared to enterprise managers who make decisions independently.

The second group of independent variables comprises demographic characteristics of managers such as gender, age and level of education⁴. The aim was to test whether there is dependency between demographic characteristics of managers with the level of knowledge and usefulness of statistics in the enterprise.

Hypothesis5. Due to the domination in the whole number of managers, men managers determine the level of knowledge and execution of statistics in Kosovo enterprises.

Hypothesis6. Average age (35-40) and maturity age (40-59) know and execute statistics more before making any decisions.

Hypotheses7. Highly educated managers know and execute statistical methods more.

In the third group of variables were included managers' characteristics with respect to the working experience, sector where the manager works, level of management and number of statistical trainings⁵. The target was to find out if there is dependency between these variables and the level of knowledge and usefulness of statistics in the enterprise.

Hypothesis8. Managers with longer working experience know and execute statistics more in the process of decision-making.

Hypothesis9. Managers of marketing units, because of the research nature alone, have tendencies to execute the procedures and statistical methods more than any other working unit.

Hypothesis10. Managers of the higher managing hierarchy know and execute statistical methods more.

Hypothesis11. Managers who have more training know statistical methods more.

5. Discussion of results and interpretation of confirmed hypotheses

In this part of the survey main results are represented resulting from the level study of knowledge and execution of statistics from managers in main enterprises in Kosovo. Research results show that more than one half of the managers use one of the statistical methods and about one third of them consider that it would be better if they used statistics more. As it was expected, highly educated managers know and use statistics more. The number of highly educated managers is also high, considering that it would be better if they used statistical methods more. Managers of the financial and accounting unit know and execute statistical methods more, which traditionally are more oriented to quantum methods (Zdenka, G. Simicevic, V. 2005).

In the question whether there is additional education needed on the field of statistical methods, more than 90 percent of the interviewed managers consider that additional education is very important and it would be useful in their jobs.

Regarding the answers of the interviewed about the methods they know and execute more in their job, most of the managers know graphical statements, about one third know arithmetical mediums and indexes, and very few know variances and trends, median and mode, and at least regression, correlation and hypotheses.

For the requirements of this survey we have classified statistical methods in two groups:

- a) Basic methods (graphical statements, arithmetical mediums, median, mode, variance and indexes).
- b) Advanced statistical methods (trends, regression, correlation and hypotheses).

According to the research results, in general, the two groups of methods are known and executed little from the managers of main enterprises in Kosovo. We should distinguish the managers of service and industrial enterprises, who more satisfactorily execute statistical procedures. Basic statistical methods are known by approximately one third of managers, and advanced statistical methods approximately by every fifth manager. As it was expected, both groups of statistical methods are known by managers with longer working experience, 6-10, and over 10 years, and also by highly educated managers and higher hierarchical management. Analysis results of Chi-square test, Asymp. Sig(2 sided) and Cramer's V are presented in chart 1. In the case of Calculated Pearson Chi-square > Tabulated Pearson Chi-square and $P < 0,05$ hypothesis is proved. If the contrary, hypothesis is not proved.

The analysis has shown good results in identifying variables which influence the level of knowledge and execution of statistics by managers of main enterprises in Kosovo. Some of the values of the resulted indicators are statistically significant and show dependency between the level of knowing statistics and some enterprise and manager characteristic. In the following results and presented hypotheses are explained.

Table 1. Significance level of the effect of enterprise characteristics in the level of knowledge and execution of statistics in business decision-making

Independent variables	Calculated Pearson Chi-square	Tabulated Pearson Chi-square	Df	Asymp. Sig(2 sided)	Cramer's V	Accept
Operation	34.175	28.869	18	0,012	0.370	Accept H1
Juridical status	8.503	7.815	3	0.037	0.330	Accept H1
Responsibilities	5.065	7.815	3	0.167	0.318	Accept H0
Manner of making decisions	2.280	7.815	3	0,0516	0.516	Accept H0

* p < .05.

In the first group of hypotheses regarding enterprise characteristics, from 4 presented hypotheses, two of them are proved, hypothesis 1 and 2.

Hypothesis1. It is proved. Gained values are statistically significant. These results are conform the expectations because industrial, agricultural or business enterprises need statistics more due to the special role these methods have in quality control (John and Johnson, 2002). This hypothesis is also supported from the value of $P=0.012 < 0.05$ (significant), which indicates that the level of knowing statistics is determined considerably by enterprise operation where the manager practices his/her function.

Hypothesis2. It is proved. Gained values are significant. According to the research results dependency was proved between the level of knowing statistics from the managers and enterprise property (private, public). As it was expected, the level of statistics execution in public enterprises is higher than in private ones, because the private sector of economy in Kosovo remains very limited and not profiled. The value of $P=0.037$ shows that the level of statistics knowledge from managers was influenced by the enterprise property unit.

Hypothesis3. It is not proved. Against the fact that managers of joint stock companies have shown higher knowledge of statistical models compared to enterprises with limited responsibilities. The value of $P=0.167$ is not significant. This indicates that the level of responsibilities in Kosovo enterprises does not determine the level of statistics execution from enterprise managers.

Hypothesis4. It is not proved. There wasn't shown any dependency between the level of statistics knowledge and execution from the managers and the manner managers make decisions (independent or collective). The value of $P=0,0516$ shows that the manner of decision-making from the managers does not determine the level of statistics knowledge from managers of Kosovo enterprises. In the second group of hypotheses regarding demographic characteristics of managers, from 3 presented hypotheses none of them is proved.

Table 2. Significance level of demographic characteristics effect of managers in the level of knowledge and execution of statistics in business decision-making

Independent variables	Calculated Pearson Chi-square	Tabulated Pearson Chi-square	Df	Asymp. Sig(2 sided)	Cramer's V	Accept
Gender	2.051	7.815	3	0,562	0.157	Accept H0
Age	15.602	28.873	18	0,620	0.250	Accept H0
Education	7.198	16.918	9	0.617	0.170	Accept H0

* p < .05

Hypothesis5. It is not proved. Insignificant differences between the level of statistics knowledge according to the gender of managers are also proved from the value of $P=0.562$.

Hypothesis6. It is not proved. According to the research results, the average age group of managers has more tendencies to know and execute statistical methods in decision-making, whereas gained results do not prove this ($P=0.620$).

Hypothesis7. It is not proved. Research results show that highly educated managers have more tendencies to know and execute statistical methods in the process of decision-making, but differences in the level of knowledge are not statistically significant($P=0.617$).

In the third group of hypotheses regarding manager characteristics according to their working place, out of 4 presented hypotheses, hypothesis 11 is proved.

Table 3. Significance level of the effect of manager characteristics according to their working place in the level of knowing and executing statistics in business decision-making

Independent variables	Calculated Pearson Chi-square	Tabulated Pearson Chi-square	Df	Asymp. Sig(2 sided)	Cramer's V	Accept
Work experience	18.469	21.031	12	0.102	0.272	Accept H0
Working unit	30.222	32.671	21	0.088	0.348	Accept H0
Level of management	9.772	12.592	6	0.135	0.243	Accept H0
Number of trainings	14.446	12.592	6	0.025	0.295	Accept H1

* $p < .05$

Hypothesis8. It is not proved. Regardless of the research results showing that experienced managers have tendency to know and execute statistical methods more in enterprises, the differences in the level of statistical method knowledge were slightly significant. This means that managers' experience does not influence evidently in the level of statistics knowledge ($P=0.102$).

Hypothesis9. It is not proved. Even though managers of finance and accounting units had more tendencies to execute statistics, there wasn't shown any dependency according to working place ($P=0.088$).

Hypothesis10. It is not proved. Managers of the higher level of management have more tendencies to execute statistics in enterprises even though the research results show that differences are not significant ($P=0.135$). Thus, the three categorical variables did not show dependency with the level of knowing statistics from the managers according to their working place.

Hypothesis11. It is proved. The value of $P=0.025$ shows dependency between the level of knowing and executing statistics and increase of trainings in statistics field. This indicates that the increase of trainings in statistics is positively reflected in the tendencies of managers in Kosovo enterprises to execute statistical methods more in the process of decision-making.

6. Conclusions and Recommendations

The aim of this study was to examine the level of knowledge and usefulness of statistical methods in Kosovo enterprises. There has not been conducted any similar research to give evidence and to convince the role of statistics in the enterprise. The research based

on the responses of 85 top managers, has shown that most of them know and apply basic statistical methods (descriptive statistics). It should be stressed that methods which are most frequently considered in statistical literature were involved in questions used for measuring the level of knowledge and usefulness of statistical methods by managers.

This research provides a good pedestal for deeper study, through the identification of key factors which may have impact on the level of recognition as well as on enforcement of statistics by enterprise managers.

Based on the study results some of the managers' characteristics have significant impact on the level of knowledge and usefulness of statistics. There is an indication that the activity and juridical status of the enterprises in Kosovo affects the level of knowledge and practical application of statistics. There seems to be a need for increasing the level of statistical knowledge in Industrial and agricultural enterprises. This might come as a result of the special role that these methods have in the control of production quality and communication of information within sectors. Statistics helps managers to monitor and use effectively methods for measuring the quality of products or services. It should be noted that the managers of public enterprises have shown more tendency to be acquainted with statistical methods than those of private enterprises. The elucidation given for the above statement is that, due to unfavorable economic policies in the country, private sector has still remained un-segmented and with the limited capacity in knowledge as well as in technology.

The study results show that the level of statistical knowledge increases with the increase of the number of trainings by managers. This coincides with the datum that 90.6% of managers declared that there is a need for additional education in statistics, while 71.0% stated that greatest use of statistical methods will help them in their work. Surprisingly, only 7 of the 85 interviewed managers were aware of statistical software (s) like SPSS (2) and MINITAB (5). This indicates that there is a need for additional trainings in advanced methods and statistical programs. The value of Chi-Square test for this hypothesis was highly significant. The study result was not significant on the level of statistical knowledge and its implementation with regards to the working sectors. Despite of this, it should be highlighted that accounting managers as well as those coming from marketing sector had more inclination to know and implement statistics in making decisions. This could be justified with the nature of work in these sectors. In the marketing sector statistics play an important role in the minimization of weaknesses when it comes to new products development, in the identification of customer focus groups as well as in trade, in the accounting sector statistics have found greater use due to the need for more numerical measurements.

It was also proved that variables like gender, age, education, working experience, the manner of making decisions, unit where manager works and level of management have no significant impact on the level of knowledge and usefulness of statistics in enterprise. The values of the Chi-Square tests were not statistically significant.

The following recommendations were based on the overall review of comprehensive results.

Firstly, improving the capacity of the statistical knowledge should be realized through offering intensive statistical courses to the managerial staff. It is therefore recommended that the program for these courses be offered in different levels, based on the managers' background as well as to the needs of the sector where they work.

Secondly, the development of advanced statistical curricula for the higher education, will contribute to the amplification of managerial capacities to the young scientists and researchers. The academic part should be closely associated with the practical needs of the Kosovo economy as well as with the countries of region.

Thirdly, the results of this study have shown that 85.2% of managerial staff was capable to use Excel software. This is an indication that managerial staff of Kosovo enterprises should get in use with powerful and professional software (s) like SPSS, MINITAB and SAS. By using these software (s), they will be able to perform a large number of statistical methods, starting from the basic to the most advanced.

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Appendix A1.

The overall characteristics of enterprises

Characteristic of enterprise	Number of Enterprises	Percentages
Activity of enterprise		
Agricultural	13	15.3
Industrial	34	40.0
Commercial	10	11.8
Post Telephone & Transport	4	4.7
Financial (banks, insurance companies)	5	6.0
Service enterprise	19	22.2
Juridical status of enterprise		

Private	59	69.4
Public	19	22.4
No answer	7	8.2
Responsibility		
Limited responsibility	34	40.0
Joint-stock-Company	16	18.8
No answer	35	41.2

Appendix A2.

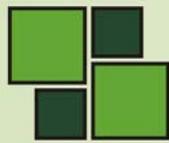
Demographic characteristics of enterprise managers

Gender structure	Number	Percentages
Female	11	12.9
Male	72	84.7
No answer	2	2.4
Age structure		
Up to 25 years	2	2.4
25-30	8	9.4
30-35	10	11.8
35-40	12	14.1
40-45	25	29.4
45-50	12	14.1
Over 50 years	16	18.8
Level of education		
High school	6	7.1
Superior	64	75.3
Master of sciences	12	14.1
Doctor of sciences	1	1.2
No answer	2	2.4
Working experience		
Up to 1 year	6	7.1
2-3 years	12	14.1
4-5 years	13	15.3
6 - 10 years	27	31.8
More than 10 years	27	31.8

Appendix A3.

Managers characteristics based on the working sector

Working Experience (in years) in current position	Number of enterprises	Percentages
Up to 1 year	11	12.9
2-3 years	30	35.3
4-5 years	21	24.7
More than 5 years	23	27.1
Working Sector		
Finances	19	22.4
Accounting	8	9.4
Marketing	12	14.1
Furnishing	12	14.1
Market	1	1.2
Informative technology	6	7.1
Human resources	5	5.9
Others	20	23.5
No answer	2	2.4



Level of Management		
High	50	58.8
Medium	30	35.3
Low	3	3.5
No answer	2	2.4
Number of Trainings by Managers		
None	36	42.4
One	16	18.8
More than one	33	38.8

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²Economic Chamber of Kosovo, 2007

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⁴Detailed descriptions of the managers characteristics are available in appendix A2

⁵Detailed descriptions of the managers characteristics based on the working sectors are available in appendix A3