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Matrices as a Data Coordination Tool in Service Research

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Introduction: For service providers, obtaining reliable information about market characteristics is the primary condition for service activity. There are two groups of methods that are appropriate to use both in other fields of science and when obtaining information in the field of services: quantitative and qualitative. The first are designed to determine the average, accurate indicators characterizing the behavior of potential consumers, the second are focused on clarifying the reasons behind customer actions. The choice of methods is always determined by the company's goals. The implementation of marketing research methods in the service helps enterprises to adapt their activities to the dynamics of the market and the wishes of consumers. Such flexibility quickly pays off in the form of high profits and an excellent reputation for the company in its field. However, the above methods, despite being up-to-date, have a low efficiency ratio. In the 21st century, in service, it is necessary to apply new methods and marketing tools to meet the ever-changing demands of customers, which our research is aimed at.

Main Research. In order to solve the research problems, a phased research was carried out, which is presented in 3 parts: A, B, C.

A) Data collection and processing in service research

Data collection in service research is carried out using different methods and research tools. Studying the studies of both local and foreign researchers, it became clear that mostly quantitative and qualitative studies are used in these studies, after which they are subjected to evaluation and data processing in laboratory conditions using various methods. The latter is time-consuming and a double process.

The goal of any empirical analysis, whether quantitative or qualitative, is to find meaningful patterns in the data. The word “meaningful” here refers to the fact that each analysis must answer the research question. The above is true for all types of data, including quantitative data, e.g. survey data, annual reports, etc., and qualitative data, such as expert data, interviews, data from various studies, etc. Data must be processed to find meaningful patterns. A common way to do this is to classify the raw data. When doing quantitative research, we make calculations using numbers to identify patterns based on categories. This is possible because we have numbers that we can use to perform arithmetic operations. When conducting qualitative research, we process spoken texts to make sense of patterns based on categories. This is possible because we have words and sentences that we can categorize and interpret. We can, for example, find out whether the answers to a running question reflect the same meaning or not. In general, it can be said that analysis is interpretation, which is accurate in both quantitative and qualitative analyses.

Compared to quantitative analysis, the interpretation of qualitative research results is somewhat more about the person rather than the object. According to the rules of the social sciences, this is an undesirable feature of qualitative analysis. Alternatively, some qualitative analysts claim to possess unique insights that are either innate or based on data from extensive professional experience. The service, being an object of social science study, is subject to the same patterns, and it is naturally difficult to carry out a study and evaluation of qualitative data, for

which we considered it necessary to address the mentioned topic, to reveal the role and significance of matrices in the service as a data collection method, as well as as a service research data processing and evaluation tool [5].

B) Matrices as a Data collection tool

The matrices have been referred to by various researchers who present their application in research works in their works. The study of the latter allows us to assume that the matrices are effective research tools that we can also localize in the service. Service matrix research is still new, and few authors have addressed its application. There are different content types of matrices, which show what information the given matrix should contain, that is, they differ from each other in the content requirements presented to the matrix. Let's consider some of them.

According to Dana Rosenberg Coker and Janice Nahra Friedel's research, outcome matrices provide a snapshot of how a particular functional area is rated by different groups. The matrix facilitates the integration of data from a variety of research tools that can be applied to any service or functional area. Thus, the data collection matrix allows for the presentation of data collected from different groups on individual requests, corresponding to a specific service or component, which leads to the creation of a systematic and unified picture that is useful for the evaluation of the functional area.

This effort to collect data from various sources has resulted in the creation of a matrix template that can be used by other institutions as a guide for constructing their own unique data collection matrix. Other institutional researchers will be able to use the model to explore their own research tools, develop their organizational work structure, and identify individual needs [6].

Other authors' matrices of data collection are also different; in particular let's refer to the matrix presented in Scheme 1 proposed by Grosvenor Public Sector Advisory:

Scheme 1

Data collection matrix according to Grosvenor Public Sector Advisory [3]

Key evaluation question	***Approach to analysis***	***Data requirements***	***Data source***	***Collection method***
List each of your key evaluation questions in a separate row of the table. To keep the scope of your evaluation practical limit the number of key evaluation questions to no more than five.	Detail what approach (or approaches) you will use to assess this key evaluation question.	*What data do you need to support your analysis?* List your data requirements such as: demographic data of the target groups, uptake, feedback on ease of use, etc. The data requirements will be specific to each program and each evaluation.	*Where will you get the data?* Sources of data might be administrative systems, publicly available reports or data sets, stakeholders, etc. Try grouping the data by source to streamline the matrix.	*How will you get the data?* Face to face interviews, surveys, reports extracted from a system, documentation request…. Don't forget to identify the volume of data collection, if relevant. For example, how many interviews: 10 x 1 hr face to face interviews.

From the above matrix, it is clear that matrices are used for data collection and evaluation. A good example of data evaluation is the matrix shown in Scheme 2, recommended by the Ontario Public Health Organization [4]. The latter regularly conducts evaluation of healthcare support programs, which would be impossible without the use of matrices.

Scheme 2

Data Collection Matrix by Public Health Ontario [4]

Objective	What did the strategy set out to do?			
Indicator(s)	What will indicate success for the objective?			
Evaluation question(s)	What critical questions do you want to answer?			
Data collection method(s)	**Data Sources**	**Timeline**	**Roles and Responsibilities**	**Methods of Data Analysis**
What tools will you use to collect the information you need?	From whom or where will the data be collected?	What is the timing for the data collection?	Who is responsible for the data collection method, and what is their role?	How will the collected data be analyzed (e.g. frequencies, chi-squares, thematic analysis)?

What can we conclude? The matrices in the service are data collection tools, through which we can carry out both preliminary research planning and later data analysis. Studying the international experience, we can conclude that these are quite effective measures, as the data obtained are presented in a systematic way. In addition, they have a number of advantages, which we will present in more detail in the next part of the article.

C) Advantages and disadvantages of using matrices

Like any research method and tool, the matrix has its advantages and disadvantages. According to the research of Professor Edward Groiland of Nijmegen University of Business (Netherlands), the matrix is used in business as a powerful tool for qualitative data analysis. Groiland mentions about matrices construction, what is needed, and etc. [8].

The matrix method aims to present a logical and structured approach to analyzing qualitative data from interviews and focus groups in a business context. Logical approach refers to matrix design; it consists of columns and rows. The structural approach is concerned with "filling in" the matrix through theories, concepts, and other data.

The method is suitable for use in diachronic (simultaneous) studies. This refers to the type of research where the so-called “time picture” is constructed. The matrix method is not suitable for long-term research because it involves analyzing processes as a function of time. The matrix method aims to find the content of the conceptual model of the study based on current, academic knowledge. Consequently, the opportunities to discover new empirical concepts and categories may be somewhat diminished.

The approach is based on existing academic knowledge and an analysis strategy that seeks to optimize opportunities to achieve useful and reliable results. These in turn enable the development of reliable and effective recommendations for business customers [5].

By combining the facts, you can say that the use of matrices in the service is really effective due to the goals and features of the service, especially by providing useful and reliable information

for customers, which in turn will be a means to increase the efficiency of service implementation.

During the research work, we localized what was said on the correlation matrix.

A correlation matrix is a statistical tool that shows how strongly and in what direction two or more variables are related to each other. It is widely used in fields such as finance, economics, psychology, and biology because it helps people understand how different things are related to each other [2].

A correlation matrix helps determine how two or more variables are related or dependent on each other. It is presented in a table format that makes it easy to read, understand and find patterns to predict what will happen in the future. An idea helps summarize data and come to sound conclusions that help investors make decisions.

Carrying out the research, we will find out the relationship between university admissions and the birth rate, whether the birth rate in RA has had an impact on the university system.

Scheme 3:

Number of students and birth rates by year [7]

Year	*Number of students in higher education institutions, total, people*	*Year*	*Number of births, people*
2022	79513.0	2004	37.526
2021	78603.0	2003	35.793
2020	79590.0	2002	32229
2019	74942.0	2001	32065
2018	80477.0	2000	34276
2017	90540.0	1999	36502
2016	92558.0	1998	33966
2015	96502.0	1997	43929
2014	79623.0	1996	48134
2013	100854.0	1995	48960
2012	102250.0	1994	51143

As it is known, to remove the correlation link, it is necessary to find the Spearman coefficient, which is determined by the following formula:

$$r = 1 - \frac{6 \sum_{i=1}^{i=n} d_i^2}{n\,(n^2-1)}$$

where r is the value of Spearman's coefficient,

d_i^2 – the square of the rank difference,

n – the number of views (pairs of ranks).

Scheme 4

Factor ranking and rank processing

Data by indicators				*Ranks difference* $d_i = r_x - r_y$	*The square of ranks difference* d_i^2
Independent (x)		*Dependent (y)*			
Value	*The rank of the* r_x	*Value*	*The rank of the* r_y		
37526	5	79513.0	9	-4	16
35793	7	78603.0	10	-3	9
32229	10	79590.0	8	2	4
32065	11	74942.0	11	0	0
34276	8	80477.0	6	2	4
36502	6	90540.0	5	1	1
33966	9	92558.0	4	5	25
43929	4	96502.0	3	1	1
48134	3	79623.0	7	-4	16
48960	2	100854.0	2	0	0
51143	1	102250.0	1	0	0
				Sum (Σ)	*76*

Since the number of our views is data from 2012-2022, which is 11 years, and the number of births is taken according to the logic that people who have turned 18 are admitted to the university, and that is why our **n** is equal to 11, from where follows the mentioned.

$$r = 1 - ((6*76) / 11*(112-1)) = 1 - (456/1320) = 0.6$$

We got a coefficient of 0.6, from which it can be concluded that the relationship between the phenomena is noticeable, moderate, according to scheme 5.

Scheme 5

Linear correlation coefficient estimate [1]

The value of the linear correlation coefficient	*Type of connection*	*Interpretation (including force of connection)*
r=0	No connection	-
0<r<1	Stright	As **x** increases, the value of **y** increases
0.1-0.3	-	Weak
0.3-0.5	-	Temperate
0.5-0.7	-	Noticwable
0.7-0.9	-	High
0.9-0.99	-	Too high
-1<r<0	Reverse	As **x** increases, the value of **y** decreases
r=1	Functional	Each argument value is assigned a single value

Based on the number of variables, which are two, it is not advisable to build a correlation matrix, that's why to present what was said more graphically, let's present it with a regression correlation model. By means of the latter, the form of connection between the phenomena and the

degree of significance of the connection are confirmed. To implement it, let's take a table of initial data (see scheme 6).

Table 6

Table of Regression Correlation Variables

Observation numbering	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
Independent variable (x) - ***Number of births***	37526	35793	32229	32065	34276	36502	33966	43929	48134	48960	51143
Dependent variable (y) - ***Number of students***	79513	78603	79590	74942	80477	90540	92558	96502	79623	100854	102250

Then it is necessary to make a correlation field in the form of a coordinate plane, for which it is necessary to use the formula of the regression model:

$$y = \beta_0 + \beta_1 X$$

where $\beta_1$is the slope of the regression line, $\beta_0$is the intersection of the regression line and **y**, which are calculated by the following formulas:

$$\beta_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} \text{ and } \beta_0 = \frac{\sum y \sum x^2 - \sum x \sum xy}{n\sum x^2 - (\sum x)^2}$$

After calculating the data, we get the following picture:

Variable	*x*	*y*	*xy*	x^2
1.	37526	79513	2 983 804 838	1 408 200 676
2.	35793	78603	2 813 437 179	1 281 138 849
3.	32229	79590	2 565 106 110	1 038 708 441
4.	32065	74942	2 403 015 230	1 028 164 225
5.	34276	80477	2 758 429 652	1 174 844 176
6.	36502	90540	3 304 891 080	1 332 396 004
7.	33966	92558	3 143 825 028	1 153 689 156
8.	43929	96502	4 239 236 358	1 929 757 041
9.	48134	79623	3 832 573 482	2 316 881 956
10.	48960	100854	4 937 811 840	2 397 081 600
11.	51143	102250	5 229 371 750	2 615 606 449
Total	434523	955452	38 211 502 547	17 676 468 573

From where it is obtained that β_1= -2.142, β_0= 1.491, from where we find the function of **y**, placing the values of **x** in sequence:

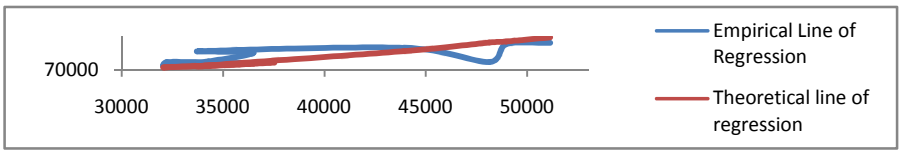

Figure 1: Representation of the regression model in the correlation field

Figure 1 shows the relationship between the number of births and the number of students, which does not seem to be very strong, so we can conclude that the decrease in the birth rate is not directly proportional to the number of students, and the decrease in the number of students in universities is related to other reasons that have not been found. in our study, because they do not derive from the problem and goals of the research.

Conclusion. The results of the research provide an opportunity to highlight the features and role of the use of matrices in service research. The latter create a link between descriptive and evaluative, quantitative and qualitative data, which in turn makes it possible to provide objective and accurate analysis and evaluation of research results.

Examining the use of matrices in service, we can conclude that

- Matrices in the service are data collection tools that can be used both as a means of research planning and implementation.
- Systematic information obtained as a result of using matrices is related to their efficiency, which in turn is due to their visuality, quick readability,
- The use of matrices in the service creates useful efficiency, which is determined by the goals and characteristics of the service, especially by providing useful and reliable information for customers, which in turn is a means to increase the efficiency of service implementation.
- The use of matrices in service research enables qualitative assessment by reducing subjectivity and increasing data accuracy and reliability.

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References

1. Andrés-Sánchez J., Belzunegui-Eraso A., Valls Fonayet F. Assessing Efficiency of Public Poverty Policies in UE-28 with Linguistic Variables and Fuzzy Correlation Measures, Mathematics. 2021, 25 p., https://doi.org/10.3390/math9020128
2. Correlation Matrix: What is it? How It Works with the Examples, Retrieved December 09, 2023, from https://www.questionpro.com/blog/category/market-research/
3. Data collection matrix template, Retrieved December 01, 2023, from https://www.grosvenor.com.au/what-we-do/public-sector-advisory/
4. Data collection matrix, Retrieved November 25, 2023, from https://www.publichealthontario.ca/en/health-topics/public-health-practice/program-planning-evaluation/evaluating-programs
5. Groenland E. Employing the Matrix Method as a tool for the analysis of qualitative research data in the business domain, SSRN Electronic Journal, 2014, 16 p.
6. Rosenberg C., Nahra F., The Data Collection Matrix Model: A Tool for Functional Area and Program Evaluation, Research in Higher Education, VoL 32, No. 1, 1991, 11 p.
7. Statistical Committee of the Republic of Armenia, Statistical Indicators, Demography, Retrieved December 01, 2023, from https://armstat.am/am/
8. Groenland E., Dana L. Qualitative Methodologies and Data Collection Methods: Toward Increased Rigour in Management Research, ISBN: 978-981-12-0653-5, 2019, p. 312.

Սերվիսային հետազոտություններում մատրիցները որպես տվյալների համակարգման գործիք

Տաշյան Մարիամ

Ամփոփում

Հանգուցային բառեր. *մատրից, սերվիս, տվյալների հավաքագրում, կորելացիոն մատրից, տվյալների գնահատում, տվյալների ներկայացում*

Աշխատանքի նպատակն է գնահատել սերվիսային հետազոտությունների արդյունավետության մակարդակի բարձրացման գործում մատրիցների դերը: Այս նպատակով աշխատանքում ներկայացրել ենք սերվիսային հետազոտություններում տվյալների հավաքագրման գործընթացը, գնահատել ենք մատրիցների դերը որպես տվյալների հավաքագրման գործիք, բացահայտել ենք մատրիցների կիրառման առավելություններն ու թերությունները և տեղայնացրել ենք կորելացիոն մատրիցը սերվիսային հետազոտություններում: Աշխատանքում կարևորվել և որպես մեթոդաբանական հիմք է ընդունվել համակարգային մոտեցումը:

Արդյունքում պարզ է դարձել, որ մատրիցները սերվիսում տվյալների հավաքագրման գործիքներ են, որոնց միջոցով կարող ենք իրականացնել ինչպես հետազոտության պլանավորում, այնպես էլ դրա իրականացում, որը հնարավորություն է տալիս խնայել ժամանակ, ռեսուրսներ, ապահովել առավելագույն ճշգրտություն և հավաստիություն, իրականացնել ինչպես քանակական, այնպես էլ որակական տվյալների հավաքագրում և ուսումնասիրություն, իրականացնել որակական գնահատում առկա տվյալների հիման վրա՝ նվազեցնելով սուբյեկտիվությունը:

Матрицы как средство координирования данных в исследованиях сервиса

Ташян Мариам

Резюме

Ключевые слова: *матрица, сервис, сбор данных, корреляционная матрица, оценка данных, представление данных*

Цель работы – оценить роль матриц в повышении эффективности исследований в сфере сервиса. В статье представлен процесс сбора данных в сервисных исследованиях, рассмотрена роль матриц как инструмента систематизации и анализа данных, выявлены их преимущества и ограничения, а также показано применение корреляционной матрицы.

Особое внимание уделено системному подходу, который используется в качестве методологической основы исследования. Матрицы позволяют организовать сбор и обработку информации, обеспечивая структурированность данных и упрощая их визуальное представление.

Результаты анализа показывают, что использование матриц в сервисных исследованиях способствует оптимизации времени и ресурсов, повышает точность и достоверность получаемых данных, а также позволяет комбинировать количественные и качественные методы анализа. Кроме того, матрицы обеспечивают объективную оценку информации и снижают влияние субъективного фактора.

Таким образом, матрицы выступают не только инструментом сбора и систематизации данных, но и эффективным средством планирования, реализации и оценки результатов исследований в сфере сервиса.

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