

## Qualimetric Approach to Quality Assessment of Historiographic Sources (Through the Example of Historiographic Researches, Dedicate to Problems of Political Education of Personnel for the Red (Soviet) Army

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**Abstract:** In this study, we have presented the technique of taking decisions while solving tasks of comparing the quality of historic and historiographic sources, using instruments and methods of qualimetry. As an initial base, we have chosen the frame of historic and historiographic sources that touch upon the problems of political education of the military of the Soviet Union. We have provided an analysis of choosing alternatives and offered solution which allows decreasing the influence of human factor on analysis' quality. We have presented an example of program on R which solves the task of generation of randomized weight coefficients. The possibility of using the suggested method while taking decisions in other spheres of activity has been shown.

**Key words:** Decision taking, stochastic domination, historiography, military history, political education of the military, sources' quality, randomization

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### INTRODUCTION

While working with historical and historiographic sources, one of essential problems is their ranging, i.e., comparing sources according to the level of confidence of reflecting studied area. Formation of consolidated information area and development of informational technologies led to qualitative changes in informational space of historic and historiographic researches. Principles of methodological pluralism (Bobkova, 2014; Magsumov, 2014) in combination with widening of source base thanks to virtualization of science area actualize the necessity of synthesis of traditional historiographic approaches with methodological instruments of knowledge management.

This task is of complex character and it does not have any well-worked methodological base. In this case, experts' knowledge and practical expertise becomes very important (Shatalova *et al.*, 2014). At the same time, similar tasks have been quite successfully resolved in management with the help of instruments and methods of quality management (Tushavin, 2014a, b; Shatalova and Chebykina, 2013). In accordance, with c ISO 9000:2008 "The adjective quality applies to objects and refers to the

degree to which a set of inherent characteristics fulfills a set of requirements". In other words, having defined the requirements made to historiographic sources, we may assess their quality. The object of this study is to adapt qualimetry methods in particular, qualimetry in respect to historiographic sources. As a working base, we have used the frame of historiographic sources, dedicated to problems of political education of the Red (Soviet) Army. Chronological framework of the source base is 74 years. The choice of data base is conditioned by researchers access to verified large frame of historiographic sources which allow carrying out practical testing of methodological instruments.

### MATERIALS AND METHODS

For solving the set out problem it is rational to use the method of building randomized quality assessments of the objects with their further comparison with the help of stochastic domination.

In majority of practical tasks that are solved with the help of qualimetry methods complex quality indicator  $Q$  is used, the building of which is performed with the help of linear convolution  $m$  of individual indices  $X^{(1)} \dots X^{(m)}$  while using weight coefficients  $p_1 \dots p_m$ :

$$Q = \sum_{i=1}^m p_i X^{(i)} \quad (1)$$

In other words, the task of building complex quality index of historiographic sources  $Q$  may be divided into two stages:

- Selection of key indicators of quality of historiographic sources which subject to inclusion into nomenclature of individual indices of linear convolution
- Definition of weight coefficients  $p_1 \dots p_m$  which reflect relative importance of individual indices  $X^{(1)} \dots X^{(m)}$

At the same time, all individual indices have the same scale direction and their relative quality increases as their value increases.

As it was shown (Rozhkov, 2011; Tushavin, 2014a, b) in case, there are not enough grounds for decisive choice of weight coefficients  $p_1 \dots p_m$ , this problem may be solved while using of coefficients' randomization model or with application of fuzzy logic methods (Semenova *et al.*, 2014). In this study, the first approach is examined.

## RESULTS AND DISCUSSION

**The main part:** Individual indices ( $X_i$ ) that characterize the quality of historiographic sources may be presented in the following way.

### X1; accessibility of the source:

- No access
- Limited access
- Access for a fee
- Free access

This index is not conventional for classical historiographic research; determinant factor that influenced its inclusion into the system of criteria characterizing historiographic searches are global tendencies for creation of scientific informational and analytical databases which include both digitally converted archive documents that had earlier been inaccessible for researches and also the complex of variable scientific publications. In this case, when we mention source's accessibility, we mean virtual and territorial accessibility of the source for the researcher: if the source is not digitally processed and in order to access the source the researcher should be physically present in archive or library source is considered to have "no access" to it.

If bibliographic description of the source is included into scientific informational and analytical system of free access while the source itself is not digitally processed such source is considered to be the one with "limited access".

In case, the source is present in scientific informational and analytical system but researcher is able to access only bibliographic description while work with the text of the source is associated with the necessity of financial resources spend in various forms (paying for access to the text of particular source, payment for subscription for working with informational and analytical base, etc.) such source is considered to be an "access for a fee".

Availability of the source in free access in global informational area allows classifying it as a "free access source".

### X2; source's category:

- Journalistic writing
- Ego-source
- Official document
- Scientific publication

### X3; historicity:

- Non-historic source
- Historiographic source
- Historical source

### X4; timeframe (in full years) between historical Source (S) and Event (E):

- $\text{Log}(S-E+1)$

### X5; type of the source:

- Sources on specific historiographic periods
- Methodological historiographic sources
- Sources on particular historical periods

### X6; width of studied historiographic problem:

- Complex ones
- The ones that are dedicated to specific problem

### X7; width of studied personalities:

- They are dedicated to historiographic periods
- They are dedicated to historical periods
- They are dedicated to particular personalities

If needed, this scale may be complemented with other indices, depending on direction of researches and aims of the researcher. It should be noted that the method in question is applicable not only to historiographic investigations but also to historical ones.

Thus in order to compare two sources, one needs to build a projection of two points in multi-dimensional area on one-dimensional scale, having selected corresponding coefficients of linear convolution.

As it has been shown earlier (Tushavin, 2014a, b) for sporadic non-negative coefficients  $p_1 \dots p_m$ , sum of which = 1, it is correct to say that their population forms  $m$ -vertex simplex in  $m$ -dimensional space:

$$S^m = \left\{ (p_1 \dots p_m) : \sum_{i=1}^m p_i = 1; p_i \geq 0, i = 1, \dots, m \right\}$$

Thus, building matrix of stochastic weight coefficients becomes a process of generation of random points, equally distributed along the surface of standard simplex. As is known, this condition is satisfied with dirichlet distribution, frequency distribution of which for  $k > 2$  and  $\alpha_i > 0$  are described by the formula:

$$f(x_1, \dots, x_{k-1}; \alpha_1, \dots, \alpha_k) = \frac{1}{B(\alpha)} \prod_{i=1}^k x_i^{\alpha_i - 1}$$

Where  $B(\alpha)$  is a multi-dimensional beta-function. In case of introduction of limitations like  $p_a \geq p_b, \dots, p_c \geq p_d$  for coefficients  $p$ , we receive irregular simplex (polytope):

$$\dot{S}^m = \left\{ \begin{array}{l} (p_1 \dots p_m) : \sum_{i=1}^m p_i = 1; p_i \geq 0, i \\ = 1, \dots, m; p_a \geq p_b, \dots, p_c \geq p_d \end{array} \right\}$$

where,  $S^m \subset \dot{S}^m$ . Reflecting points ( $P/P \in \in \Delta \dot{S}$ ) as regard to subspaces that correspond to inequality, we receive the points that are equally distributed in specified polytope (Rubin, 1984). Algorithm of random vectors' generation with consideration of possible limitations in terms of R importance R (R Development Core Team, 2014; Warnes *et al.*, 2014) is presented Algorithm A.

```

Algorithm A; library(gtools):
rpoly<-function(n=1, size=2, test=data.frame()) {
  mtx<-rdirichlet(n, rep(1, size))
  if(length(test)==0) return(mtx)
  for(j in 1:n) {
    while(TRUE) {
      flag=TRUE
      for(i in 1:nrow(test)) {
        if(mtx[j, test$master[i]] < mtx[j, test$slave[i]]) {
          tmp<-mtx[j, test$slave[i]]
          mtx[j, test$slave[i]] <- mtx[j, test$master[i]]
          mtx[j, test$master[i]] <- tmp
          flag=FALSE
        }
      }
      if(flag) break
    }
  }
  return(mtx)
}

```

Let us assume that values of randomized complex index  $Q$  for quality of (A) and (B) objects may be calculated according to (Eq. 1). Solution regarding preferring one object to another may be taken by means of comparing  $Q_A$  and  $Q_B$ . However, after randomization, satisfaction of inequation  $Q_A > Q_B$  is a random event with probability  $P(Q_A > Q_B)$ . If mentioned probability exceeds some threshold value  $\gamma$ , then one may consider that object A stochastically dominate object B.

In this case, quality model of historiographic source may be described via the following linear convolution  $Q = P_1 X^{(1)} + P_2 X^{(2)} + P_3 X^{(3)} + P_4 X^{(4)} + P_5 X^{(5)} + P_6 X^{(6)} + P_7 X^{(7)}$  where  $X$  (i) are values of individual indices of source's quality and  $P_i$  are vectors of corresponding coefficients.

Let us assume that there are the following priorities of the values:  $P_5 > P_1, P_5 > P_2, P_5 > P_3, P_5 > P_4, P_2 > P_1, P_2 > P_3, P_2 > P_4, P_1 > P_3, P_1 > P_4$ . Then matrix of  $1000 \times 5$  elements with set limitations may be obtained in the following way (Algorithm B):

```

Algorithm B; > set.seed(2015):
> mtx<-rpoly(1000, 7,
+ data.frame(master = c(5, 5, 5, 5, 2, 2, 2, 1, 1),
+ slave = c(1, 2, 3, 4, 1, 3, 4, 3, 4)))
> summary(mtx)
  V1      V2      V3      V4
Min. :0.00873 Min. :0.04166 Min. :3.461e-05 Min. :8.146e-05
1st Qu.:0.07711 1st Qu.:0.13303 1st Qu.:1.192e-02 1st Qu.:2.731e-02
Median :0.10952 Median :0.17629 Median :2.740e-02 Median :5.115e-02
Mean :0.11131 Mean :0.17939 Mean :3.614e-02 Mean :5.581e-02
3rd Qu.:0.14424 3rd Qu.:0.21940 3rd Qu.:5.203e-02 3rd Qu.:7.964e-02
Max. :0.26235 Max. :0.40837 Max. :1.669e-01 Max. :1.663e-01
  V5      V6      V7
Min. :0.05989 Min. :0.0000583 Min. :0.000011
1st Qu.:0.24491 1st Qu.:0.0500483 1st Qu.:0.047827
Median :0.31390 Median :0.1123544 Median :0.106502
Mean :0.32388 Mean :0.1479889 Mean :0.145482
3rd Qu.:0.39221 3rd Qu.:0.2174812 3rd Qu.:0.208369
Max. :0.79738 Max. :0.6648018 Max. :0.805669

```

Further calculations, needed for comparison of historiographic sources according to algorithm, indicated above are trivial and consist in finding vector  $Q$  for each of the source, finding probability of domination and taking decision on the base of threshold value.

### CONCLUSION

In conditions of dynamic fundamental transformations of informational space, the problem of analysis of historiographic sources becomes a systemically important ones that allow to verify processes of accumulation and analysis of historiographic data.

Traditional methods of investigation of historiographic sources (Bobkova, 2014) does not allow to the full extent exclude "human factor" and perform non-prejudicial verification of sources that are available for modern researcher which actualizes the need to

synthesize classical methodology of historical and historiographic science with tested instruments of management and intellectual assets.

Described approach is a new one and may be used for solving of a wide variety of tasks that are associated with ranging various historical and historiographic sources.

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