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VOLUNTEERING IN HUMANITARIAN LOGISTICS: A STRUCTURAL EQUATION MODELING

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Abstract: Humanitarian logistics uses logistic concepts to respond to the countless assists, minimize the improvisations and be effective, in terms of response time. The role of the volunteers is crucial to the efficiency of all the logistic processes. Thus, the volunteer managers need to understand how to capture and motivate the volunteers for humanitarian causes. To perceive the volunteers' motivations, a survey was developed for a food bank. A Structural Equation Modeling (SEM) was implemented, that enabled the simultaneous examination of a series of interrelated dependence relationships between the measured variables and latent constructs.

Keywords: Volunteering, Humanitarian Logistics, SEM, Human Capital, Social Capital, Physical and Economic Capital.

1 INTRODUCTION

Based on the understanding of the International Federation of the Red Cross, Nogueira *et al.* [12] define humanitarian logistics as processes and systems involved in the mobilization of people, resources, and knowledge to help vulnerable communities affected by natural disasters or complex emergencies. It intends to respond to a large number of people, avoiding waste. At the same time, acting within a limited budget, organize the various donations received.

From all the resources needed, the human resource is of the utmost importance, since the people that practice humanitarian logistics are almost all volunteers, who donate their time to help others and don't demand any payment for that.

The defining features of volunteerism as voluntary, sustained and ongoing helpfulness suggests that it may be interesting to inquire about the motivations that may dispose individuals to seek out volunteer opportunities, to commit themselves to voluntary helping, and to sustain their involvement in volunteerism over extended periods ([4], [11]).

Clary *et al.* [3] identified six different motivational functions: social, value, career, understanding, protective and esteem and presented an inventory designed to measure these motivations and provided recommendations for volunteer administrators who seek to increase the number of people who volunteer and to improve their human resource management. Wilson and Musick [16] construct an integrated theory of formal and informal volunteer work based on the premise that volunteer work is (1) productive that requires human capital, (2) collective behavior that requires social capital, and (3) ethically guided work that requires cultural capital. They estimate a model in which formal volunteering and informal helping are reciprocally related but connected in different ways to different forms of capital.

The International Labour Office, in Geneva, elaborate the "Manual on the measurement of volunteer work" [6] and they refer that volunteer work delivers significant benefits to society

and the volunteers themselves such as economic impact; provides important employment training and access to the labor force; enhances social solidarity, social capital, political legitimacy and the quality of life in society; can help to promote social inclusion and integration and gives the volunteers themselves a sense of personal satisfaction, fulfillment, wellbeing and involvement in society. Also, the Institute for Volunteering Research developed the Volunteering Impact Assessment Toolkit in late 2004 to help organizations undertake their research to assess the impacts of volunteering, categorizing these impacts into five key capitals [13]: Economic capital; Physical capital; Human capital; Social capital; and Cultural capital.

Miller [10] describes the student volunteers' perceptions of the impact their volunteering in a Medical Center. It divide on human capital (acquisition of skills and personal development), social capital (creation of relationships, building strong bonds, and networking), physical and economic capital (professional skills to enhance future career path), and cultural capital (new perspectives of different cultures). Recently, a wide number of research publications have been dedicated to addressing the issue of volunteer satisfaction and its dependence on motivation ([1], [5], [11]) related to these dimensions.

Food banks are not-for-profit organizations that aim to minimize the hunger problem in society by working with contributors on the upstream and associations on the downstream of their supply chains. These organizations operate in highly complex environments due to the uncertainties associated with supply and demand [2]. The use of volunteers is a huge challenge for these organizations since this human resource doesn't demand payment but adequate motivation.

In this research, it is intended to observe the principal motivations and expectations of the volunteers in a food bank, located in the north of Portugal, on the dimension: Human Capital, Social Capital and Physical and Economic Capital. To understand the relationship between these expectations, a Structural Equation Modeling approach was performed.

2 METHODOLOGY

The methodology used in this research was quantitative, with a survey applied to the volunteers of a Bank Food against Hunger located in the North of Portugal. The main objective was to analyze the motivations of the individual that give their free time to help others.

The survey is composed of two parts: one related to socio-demographic characteristics of the volunteers aiming to sketch a volunteer profile [15]; a second part is concerned with the personal motivations to practice volunteering, giving focus on the three dimensions previous explained (Human Capital, Social Capital and Physical and Economic Capital). This last part was adapted from Miller [10] work, and a five-point Likert scale was used (where 1 - Decreased a lot; 2 - Decreased; 3 - Stayed the same; 4 – Increased; 5 - Increased a lot) for several items per dimension (see Table 1). The choice of latent variables corresponding to the Miller works, as the observed variables were selected/adapted from the food bank reality.

To analyze the survey, a set of tools under the Structural Equation Modeling (SEM) was used. SEM is a confirmatory approach to data analysis involving a priori assignment of inter-variable relationships [17]. SEM approach is composed of two parts: a measurement model, which contemplates the relationship between the latent factors and the observed variables, and the structural model that produces the path direction and strengths of the relationship between the latent variables [9]. Model fit was assessed using several goodness-of-fit indices, namely the ones suggested by Hu and Bentler [8]: Mean Square Error of Approximation (RMSEA < 0.06), Standardized Root Mean Squared Residual (SRMR < 0.80), and a Comparative Fit Index (CFI>0.95).

Table 1 –Human developing measures for the volunteering

Latent variable	Observed variable	Item description
Human Capital	H1	Confidence in my abilities
	H2	Sense of self-esteem
	H3	Sense of self-management
	H4	Sense of making a useful contribution to the community
	H5	Awareness of the effects of my actions on the others
	H6	Sense of motivation
	H7	Willingness to try new things
	H8	Trust in other people
	H9	General well-being
Social Capital	S1	Ability to communicate with other people
	S2	Social and interpersonal skills
	S3	Friendships
	S4	Support networks
	S5	Sense of community
	S6	Interest in volunteer work
Physical and Economic Capital	PE1	Direct access to training/learning related to a future career
	PE2	Direct access to experience related to a future career
	PE3	Ability to use my skillset
	PE4	Recognition received
	PE5	Ability to get a job
	PE6	Number professional contacts

3 RESULTS AND DISCUSSION

The sample is a convenient one, having obtained 144 completed surveys, distributed by volunteers in the warehouse, and collected in supermarkets during a weekend of the food collection campaign. The statistical analysis was performed in IBM SPSS and AMOS, vs 27.

3.1   Descriptive Statistics and Principal Component Analysis

The sample had both genders (60% female and 40% male), where most of the volunteers are under 30 years old (60%), and 16% have more than 50 years old. Only 19% of inquiries have bachelor or higher education, while 44% and 37% have a middle and high school, respectively. Most of the volunteers are students (51%), and only 7% are retired. The remaining are employed. Most of the volunteers live near to the Bank Food (less of 30km distance).

The three dimensions for the volunteers' motivations were resorting to descriptive statistics and Principal Component Analysis (PCA), as Tables 2, 3, and 4 show.

Table 2 - Human capital: descriptive statistics, reliability, and PCA

Observed Variable	Min	Max	Mod	Mean	St. Dev	Sk	Kurt	Cronbach's alpha	Commu-nalities	Loadings	KMO Measure	Bartlett's test
H1	3	5	4	4.14	0.628	-.109	-.492		.688	.830		
H2	3	5	4	4.08	0.687	-.101	-.861		.686	.828		
H3	3	5	4	4.19	0.622	-.155	-.520		.620	.787		
H4	3	5	5	4.47	0.579	-.538	-.659		.555	.745		
H5	3	5	4	4.30	0.606	-.253	-.604	0.925	.638	.799	0.847	< .001
H6	2	5	4	4.30	0.661	-.556	.000		.685	.827		
H7	3	5	4	4.33	0.640	-.430	-.675		.590	.768		
H8	1	5	4	4.04	0.763	-.455	.408		.462	.680		
H9	3	5	4	4.27	0.641	-.316	-.678		.736	.858		

- Social capital: descriptive statistics, reliability, and PCA

Observed Variable	Min	Max	Mod	Mean	St. Dev	Sk	Kurt	Cronbach's alpha	Commu-nalities	Loadings	KMO Measure	Bartlett's test
S1	3	5	4	4.22	0.675	-.294	-.809		.603	.777		
S2	3	5	4	4.13	0.678	-.172	-.816		.620	.788		
S3	3	5	4	4.20	0.701	-.299	-.935	0.892	.629	.793	.801	< .001
S4	3	5	4	4.04	0.736	-.067	-1.135		.658	.811		
S5	3	5	4	4.35	0.642	-.462	-.671		.733	.856		
S6	3	5	5	4.44	0.589	-.501	-.652		.658	.811		

Table 4 - Physical and Economic capital: descriptive statistics, reliability and PCA

Observed Variable	Min	Max	Mod	Mean	St. Dev	Sk	Kurt	Cronbach's alpha	Commu nalities	Loadings	KMO Measure	Bartlett's test
PE1	3	5	3	3.71	0.704	.484	-.870		.785	.886		
PE2	3	5	3	3.64	0.686	.609	-.713		.791	.889		
PE3	3	5	4	3.90	0.632	.079	-.477	0.918	.746	.864	.849	< .001
PE4	3	5	4	3.82	0.662	.215	-.725		.699	.836		
PE5	3	5	3	3.53	0.726	.984	-.416		.634	.796		
PE6	3	5	3	3.54	0.648	.792	-.403		.612	.782		

The minimum value of responses in most observable variables is 3, which indicates the experience was at least neutral or positive. Human and social capital dimensions (Tables 2 and 3) have means above 4 for all items, meaning that this experience increases their personal development. The responses related to physical and economic capital (Table 4) are lower, where mode and mean are located around 3, which indicates that volunteer does not produce significant effects for the physical and economical capital. One of the reasons could be the amount of very young volunteers, which are not thinking about economic aspects for the future.

The answers distribution for each variable is considered normal, taking into account the conservative approach of Kline [9]: the absolute values of skewness is less than 3 and the absolute values of kurtosis are less than 8. The scale reliability of studies by Cronbach's alpha; each latent variable reached values higher than 0.7, pointing out good internal reliability of the dimension [14].

A Principal Component Analysis (PCA) was conducted to understand the relationship between variables. The commonalities achieved allows the maintenance of almost all the variables in the analysis. Hair *et al.* [7] argue that a variable that presents communality below 0.5 should not be maintained in the factor analysis. In this research, only H8 didn't reach this value. It was an option to maintain due to the feeling (trust) entails in a volunteering practice. The factorial weights (loadings) indicate that all the items present high values and a positive correlation with the latent variables. Besides, the Kaiser-Meyer-Olkin (KMO) measure is near to 1 for all latent variables. Bartlett's test gives a significant level of less than 0.001, which indicates a possible relationship between observed variables.

3.2 SEM Approach

For the estimation of the measurement model of each of the constructs, the maximum was used the likelihood method. The first results generated did not show good fit indices. Table 5 shows the adjustment measures, which are based on the acceptance levels suggested by Kline [9]. Thus, there was a set of steps done to improve the model. Through the Mahalanobis distance, one observation was removed because it was considered an outlier. Item H7 shown the lowest results, and it was dropped from the model. Besides, modification indices were applied to improve the model's goodness-of-fit with evidence of misspecification associated with pairing

error terms. The analysis of the modification indices suggested that there is a set of pairs in each construct that influenced each other. The new values demonstrated that the respecified model presented better levels of adjustment, as can be seen in Figure 1. Even so, one of the fit measures is not reached the acceptable level. However, removing more indicators or preparing new correlations between the links, could lead to a model misrepresentation.
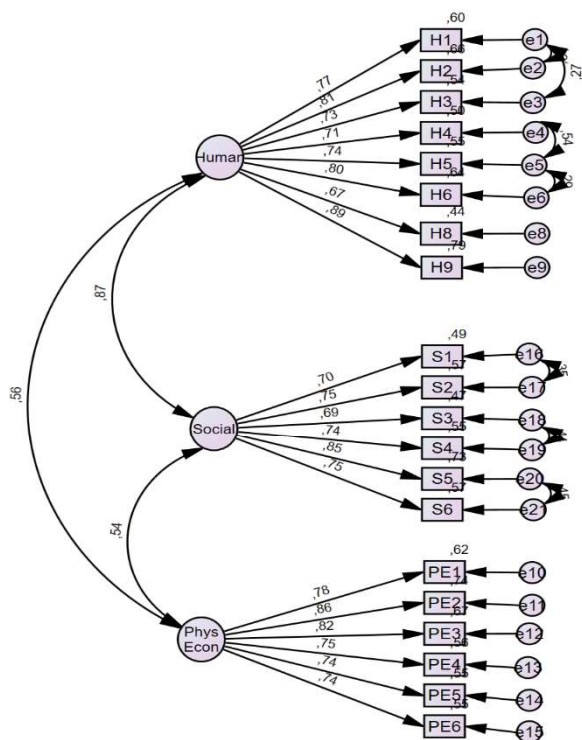
Name of index	Initial model	Final model	Level of Acceptance (Kline, 2005)
Chi-square/df	2.39	1.63	< 5
RMSEA	0.114	0.077	<0.08
CFI	0.845	0.936	>=0.90
GFI	0.719	0.813	>=0.95

Figure 1 – Standardized coefficients and covariance (Final model)

Figure 1 shows the final model related to human development in volunteering practices. All coefficients are significant at 0.01 level, and the model indices indicate that fits well the data sample. All items have high factor loadings. There is a considerable relationship between human and social constructs (with a correlation of 0.87). Each standardized regression weights have a value higher than 0.66, each reinforce the presence of these items in the initial scale.

4 CONCLUSIONS

There are numerous challenges that the human being has to be able to respond to, namely his assistance in a correct manner and at an appropriate time, as only in this way is it possible for humanitarian logistics to be efficient. The results achieved by the model allow us to state that the reason for such behavior of the Bank Food volunteer can be explained by a set of interactions between these three constructs: human, social, and physical and economic capital. By modeling the structural equation, it was found that all the connections between the constructs are statistically significant. The inquiries agree that the experience is positive, and can contribute to improve their human and social capacities. These results are following the ones achieved by Miller [10], in a different context. The volunteers agree that gain more experience, more social connections, and more motivation to help to construct a better

community. These could help in future fundraising for volunteers for the Food Bank campaigns to have more data to motivate other individuals to come and offer their free time.

Acknowledgement

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