



THE ROLE OF INTELLECTUAL CAPITAL REPORTING IN THE PROCESS OF SUPPLY CHAIN INTEGRATION OF THE MILITARY TECHNICAL INSTITUTE

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Abstract: *The Military Technical Institute (MTI) is the largest military scientific and research institution in the Republic of Serbia. It mainly realizes its supply chain from the approved budget funds of the Republic of Serbia, while a smaller part is realized from its own revenues. Her continuous work to improve non-financial performance within the supply chain as well as motivate employees to manage their supply chain integration (SCI) initiatives requires intellectual capital (IC) tracking and reporting. Analysis and reporting on IC in MTI can be done within the human, organizational and social dimensions of IC. This paper will examine the role of IC reporting and examine its impact on SCI in MTI. The aim of the paper is to determine that the monitoring and reporting of IC affects the process of SCI in MTI.*

Keywords: *reporting, intellectual capital, supply chain, Military Technical Institute.*

1. INTRODUCTION

The Military Technical Institute (MTI) is a scientific and research institution that is part of the Ministry of Defense of the Republic of Serbia. The development of weapons and military equipment, as high-tech products, is the main goal of MTI. During the past few decades, MTI has played an important role in the modernization of weapons and military equipment. The improvement of operations at MTI can be influenced by several stakeholders, including the companies with which MTI cooperates. The MTI supply chain is realized mainly from the budget of the Republic of Serbia, while a part is realized from own revenues and donations. That is why supply chain networks are usually more complex than networks of for-profit scientific research institutions.

Supply, demand and internal integration are the three constitutive aspects of supply chain integration (SCI) [1]. Although SCI is known to vary greatly from institution to institution, three types of aspects of SCI are key to improving MTI performance. MTI's ability to manage and report on human, organizational and social capital is critical to strengthening SCI. MTI, unlike for-profit institutions, is limited in terms of its organizational assets (such as an institutionalized knowledge base) and its talent management capabilities. Therefore, it is important to direct organizational and human resources in order to create a higher level capability that relies on synergy and advantage in cooperation [2].

Careful management of organizational and human capital is crucial for self-sustaining operations. SCI is considered a set of elements in operations, which can be used to help find solutions for efficiency and develop simplified processes of coordination of organizational activities inside and outside the system [3]. The empirical SCI literature shows that integration practices lead to improved operational and financial performance.

Although the benefits of SCI have already been studied and evaluated in for-profit enterprises, empirical validation of SCI in a non-profit military context is lacking. One of the contributions of this work lies in filling this gap.

2. INTELLECTUAL CAPITAL IN THE MILITARY TECHNICAL INSTITUTE

Individual knowledge, skills, norms and values, culture and behavior of employees, databases, methodologies, standards and procedures and licenses in MTI glass have received considerable attention as a source of competitive advantage during the last few decades. The unique term IC is used to describe these components in MTI.

Specifically, IC in MTI is considered a driver of both financial and non-financial performance. IC is one of the most important components, which contributes to MTI's achievement of the set goals. Knowledge exchange processes that cross borders are also included in this form of capital.

Social capital facilitates the actions of individuals and increases the efficiency of action. Unlike for-profit organizations in which social capital is conceived to be directly connected with SCI [12], in MTI it can be concluded that human capital and organizational capital are the building blocks of social capital. Furthermore, social capital is a key driver of SCI in MTI, as it facilitates "identification" - the process through which group members take the values or standards of other group members as their frame of reference.

Norms of social capital include individuals, who have an identity, common interests and commitment to the common good, a group. Teamwork, information exchange, joint decision-making and joint understanding are the basis for achieving a social goal [13], i.e. production and modernization of weapons and military equipment at MTI.

Human capital, manifested in the workforce, is key to finding effective solutions for strategic problem solving in MTI.

Organizational capital is the institutional knowledge that exists in MTI, which is stored in manuals, databases and reports. For example, MTI has manuals for employees, customers, suppliers, customers, donors and other foreign forces, as well as various forms and databases that store information about MTI's operations.

Finally, social capital, which is characterized by interactions between individuals, is perhaps the most critical element of MTI. The social capital of MTI enables the creation of consensus and focuses on a common goal - equipping and modernizing the Serbian Armed Forces.

3. SUPPLY CHAIN INTEGRATION IN THE MILITARY TECHNICAL INSTITUTE

The SCI concept has received considerable scholarly attention in the research literature spanning more than a decade [14]. SCI is generally classified into two dimensions - internal and external integration. Internal integration involves the synchronization of information and integrative initiatives between functions within the institution. External integration, in contrast, refers to the level of cooperation of the institution with its suppliers, partners and customers [15]. Flynn, Huo and Zhao define SCI as the degree of strategic cooperation of an organization with its customers and suppliers and the management of processes within the organization. Collaboration with supply chain partners, as well as integration of functions within an institution, in several research studies have shown that SCI affects operational and financial performance [16]. Internal integration is a task in MTI, which is usually organized with management staff [17]. Resource limitations and the nature of work often do not allow for a large organizational structure, which negatively affects the work of MTI. The integration of supply takes place in each sector of MTI, which enables the Management of MTI to better plan the quantities of material assets that need to be procured in a certain period of time.

MTI's ability to coordinate distribution, shipping and inventory management tasks depends on the level of coordination with partners such as suppliers, customers, etc. The exchange of information with partners and the need for transportation and shipping capabilities determine demand integration [18]. SCI mainly focuses on information sharing, teamwork, building relationships and close ties that go beyond everyday transactions. KC, which is derived from resource-based capital (RC), indicates that knowledge is the most important strategic resource of an institution [19]. RC indicates that institutions seek valuable, rare, inimitable and non-substitutable resources to achieve competitive success [20]. Human knowledge-based resources are strategic in the sense that they bring skills, practices, knowledge and capabilities that add value to the institution [21]. MTI employees are like other employees in other institutions, but they possess specific knowledge and skills that are used to solve complex problems, regardless of the fact that they are not in profit institutions.

A review of the literature shows that SCI has primarily been examined in the context of private sector organizations and institutions. Therefore, understanding the nature and potential of the SCI of state organizations and institutions that realize social goals is a relatively under-researched area. Similar to private enterprises and MTI, as a military organization it must manage a constant flow of materials, services and information in order to achieve its objectives. In addition, MTI faces unique budgetary, infrastructure and staffing constraints, which require innovative approaches to managing operations. Compared to for-profit supply chains, the number of non-profit supply chains is much smaller, so to obtain an adequate sample size of respondents for statistical analysis, it is often necessary to collect data from a relatively large number of employees.

4. RESEARCH PROBLEM

The problem of the research is to determine the existence of a difference in the degree of influence of IC reporting on SCI in MTI between people who deal with logistics (transportation, supply, maintenance, general logistics, health, infrastructure, resource protection, etc.) and people who they do not deal with the mentioned jobs.

The aim of the research

The aim of the paper is to examine the degree of impact of IC reporting on SCI in MTI, with a special emphasis on persons engaged (experimental group) and those not engaged (control group) in logistics business.

The subject of the paper is the influence of IC on SCI in MTI.

Research hypotheses

H1- There is a difference in the degree of impact of IC reporting on SCI in MTI between the "experimental" and control groups.

H2- There is a difference in the degree of impact of IC reporting on SCI in MTI between the "experimental" and

control groups in relation to gender.

H3- There is a difference in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to age.

H4- There is a difference in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics business in relation to whether or not they are engaged in logistics business.

5. RESEARCH METHODOLOGY

The research belongs to the group of non-experimental research considering that the variable is not directly manipulated, but only by examining the individual difference and the connection between the variables. According to the control conditions, this research is included in the field research group. According to the purpose of the research, this research can be characterized as an explanatory research, and it is conducted for fundamental (educational) purposes. The sample consisted of a total of 48 respondents, that is, 48 employees of the Military Technical Institute, both sexes, aged from 20 to 65 years (younger age group 20 to 45 years and older age group 45 and over). The sample was divided into two groups: experimental group – 24 subjects engaged in logistics and control group – 24 subjects not engaged in logistics.

In this research, the sample is convenient. Tables 1, 2 and 3 show the distribution of the sample according to gender, age and group (experimental and control).

Table 1. Distribution of the sample by gender

Male	Female	Total
28 (58,2%)	20 (41,8%)	48 (100%)

Table 2. Distribution of the sample according to age

Younger	Older	Total
25 (52,2%)	23 (47,8%)	48 (100%)

Table 3. Distribution of the sample by group

Experim. group	Control group	Total
24(50%)	24(50%)	100 (100%)

The results obtained from the research were statistically processed with an adequate selection of statistical methods. Descriptive and inferential statistical analysis was used in statistical processing. Statistical processing of the data was performed using the package for statistical processing of data in the social sciences SPSS (SPSS, version 21.0). The results are tabulated.

One-factor multivariate ANOVA was used to examine the differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups. The examination of differences in the degree of impact of IC reporting on SCI in MTI between the "experimental" and control groups in relation to gender was performed with the help of a two-factor multivariate

ANOVA. A two-factor multivariate ANOVA was also used to examine the differences in the degree of influence of IQ reporting on SCI in MTI between the "experimental" and control groups in relation to age. The examination of the differences in the degree of influence of IC on SCI in MTI among persons engaged in logistics business in relation to whether or not they are engaged in logistics business in percentage was carried out with the help of one-factor multivariate ANOVA. Table 4 shows the classification of variables according to the role of the research, the way of expressing values, the level of measurement and the degree of control.

Table 4. Classification of variables

Variable	Role in research	A way of expressing values	Measurement level	Degree of control
Gender	Independent	Categorical	Nominal	Registered
Age	Independent	Categorical	Nominal	Registered
% dealing with logistics	Independent	Categorical	Ordinal	Registered
Group of respondents	Independent	Categorical	Nominal	Registered
They deal with logistics	Independent	Categorical	Nominal	Registered
Impact of IC reporting on SCI	Independent	Numeric	Interval	Registered

Taking into account the fact that the sample size is not negligible, the obtained results should be seen as a good approximation of the results that would be valid for a much larger number of respondents. The research was conducted at the MTI in February 2024, with respondents filling out a questionnaire. The sample type is random. Respondents were tasked with answering 25 questions about the impact of IC reporting on SCI in MTI by rounding the marks on a scale of 0-4 (0 - "completely disagree", 1 - "mostly disagree" 2 - "not sure", 3 - "mostly agree", 4 - "completely agree"). By adding up the scores (summary score) for each question in the questionnaire, five categories of degree of influence are obtained: 1 - normal level (0-19), 2 - mild level (20-39), 3 - moderate level (40-59), 4 - moderately extreme level (60-79), 5 - extreme level (80-100). The reliability of the guide, estimated by Krombach coefficient α , can be considered satisfactory ($\alpha = 0.71$).

6. RESEARCH RESULTS

In order to verify the first research hypothesis, one-factor multivariate ANOVA was applied.

Table 5 shows descriptive statistics for the variable belonging to the exam group.

Table 5. Descriptive measures of the "experimental" and control groups of respondents

Groups of respondents	N	M	SD	SEM
Experimental group	24	1,5372	,44833	,08890
Control Group	24	,5592	,45832	,09235
Total	48	1,0274	,67095	,09641

N - number of respondents, M - average (arithmetic mean), SD - standard deviation (deviation), SEM - Standard Error of the Mean

The obtained results of the research are shown in Table 6. In this research, the degree of influence of IC reporting on SCI in MTI is a numerical variable, and the group of respondents is a categorical variable.

Table 6. Difference in the degree of impact of IC reporting on SCI in MTI in relation to the group of respondents

Relation	rc χ^2	df	M	F	p
sum score x group	11,434	1	11,434	57,274	,00

rc χ^2 - the value of the given statistic, df - number of degrees of freedom, M - average, F - statistic, p - significance level

The research revealed statistically significant differences ($p < 0,05$) in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups ($F = 11,434$, $df_1 = 1$, $df_2 = 46$, $H_0 = \text{rejected}$, groups differ). Analyzing the average of the arithmetic mean of the two groups of respondents from Table 5, it can be concluded that in the "experimental group" the opinion that IC affects SCI in MTI is more prevalent. It follows that there are differences in the degree of influence of IC reporting on SCI between the "experimental" and control groups.

Differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to gender

In order to check the second research hypothesis, a two-factor multivariate ANOVA was also applied.

Table 7 shows descriptive statistics for the variables gender and belonging to the group of respondents in the sample ($N=48$).

Table 7. Descriptive measures of the degree of impact of IC reporting on SCI in MTI in relation to the respondent's gender and group affiliation

Sex of the respondent	Group of respondents	N	SD	M
Female	Experimental group	8	,48375	1,5099
	Control group	12	,58257	,6621
	Total	20	,67423	1,0105
Male	Experimental group	16	,41522	1,4299
	Control group	12	,17653	,4176
	Total	28	,64257	1,0522
Total	Experimental group	24	,42155	1,5198
	Control group	24	,43522	,5318
	Total	48	,65158	1,0299

N - number of respondents, M - average (arithmetic mean), SD - standard deviation (deviation)

The obtained results of the research are shown in Table 8. In this research, the degree of influence of IC reporting on SCI in MTI is a numerical variable, while the gender of the respondents and the groups of respondents ("experimental" and control) are categorical variables.

Table 8. Differences in the degree of influence of IC reporting on SCI in MTI in relation to gender between respondents of the "experimental" and control groups

Source	Sum of Squares	df	MS	F	p
Corrected Model	11,895a	3	3,921	19,963	,000
Intercept	47,985	1	47,985	244,877	,000
Sex	,125	1	,125	,699	,389
Group	10,686	1	10,686	53,819	,000
sex * group	,197	1	,197	1,125	,276
Error	8,663	44	,185		
Total	71,981	48			
Corrected Total	20,543	47			

a. R Squared = ,578 (Adjusted R Squared = ,549)

df - number of degrees of freedom, MS - arithmetic mean, F - statistic, p - significance level

H01: There is no influence of gender on the degree of influence of IC reporting on SCI in MTI.

$F(1,44) = 0,699$ $p > 0,05$ We do not reject H_0 . There is no influence of gender on the degree of influence of IC reporting on SCI in MTI.

H02: There is no influence of belonging to the group ("experimental" and control group) on the degree of influence of IC reporting on SCI in MTI.

$F(1,44) = 53,819$ $p < 0,01$ We reject H_0 . There is an influence of belonging to the group ("experimental" and control group) on the degree of influence of reporting on IC on SCI in MTI.

Interaction: $F(1,44) = 1,125$ $p > 0,05$

Using a two-factor multivariate ANOVA, no statistically significant differences ($p > 0,05$) were obtained in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to gender $F(1,44) = 1,125$ $p > 0,05$. The null hypothesis is not rejected, that is, there are no differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to gender.

Differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to age

To test the third research hypothesis, a two-factor multivariate ANOVA was applied.

Table 9 shows descriptive statistics for the variables age of respondents and affiliation of respondents to the group of respondents.

Table 9. Descriptive measures of the degree of influence of IC reporting on SCI in MTI in relation to the age of the respondents and belonging to the group

Groups of respondent	Age of the respondents	N	SD	M
Experimental group	younger	13	,44363	1,5411
	older	11	,43526	1,4865
	Total	24	,43121	1,5187
Control group	younger	12	,54845	,5874
	older	12	,32856	,4978
	Total	24	,44029	,5322
Total	younger	25	,69155	1,0874
	older	23	,62492	,9676
	Total	48	,65766	1,0214

N - number of respondents, M - average (arithmetic mean), SD - standard deviation (deviation)

The obtained results of the research are shown in Table

10. In this research, the degree of influence of IC reporting on SCI in MTI is a numerical variable, while the age of the respondents and the groups of respondents ("experimental" and control) are categorical variables.

Table 10. Differences in the degree of influence of IC reporting on SCI in MTI in relation to age between subjects of the "experimental" and control groups

Source	Sum of Squares	df	MS	F	p
Corrected Model	11,520a	3	3,756	18,768	,000
Intercept	51,332	1	51,332	250,796	,000
grp	10,956	1	10,956	54,911	,000
starost	,059	1	,059	,297	,577
grp * starost	,002	1	,002	,007	,944
Error	8,802	44	,193		
Total	71,856	48			
Corrected Total	20,574	47			

a. R Squared = ,562 (Adjusted R Squared = ,533)

df - number of degrees of freedom, MS - arithmetic mean, F - statistic, p - significance level

H01: There is no influence of belonging to the group ("experimental" and control group) on the degree of influence of IC reporting on SCI in MTI.

F (1,44)= 54,911 p< 0,01 We reject H0. There is an influence of belonging to the group ("experimental" and control group) on the degree of influence of reporting on IC on SCI in MTI.

H02: There is no influence of age on the degree of influence of IC reporting on SCI in MTI.

F (1,44)= 0,297 p> 0,05 We do not reject H0. There is no effect of age on the degree of influence of IC reporting on SCI in MTI. Interaction: F(1,44) =0,007 p>0,05

Using a two-factor multivariate ANOVA, no statistically significant differences (p>0,05) were obtained in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to age F(1,44) =0,007 p>0,05 . The null hypothesis is not rejected, that is, there are no differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to age.

Differences in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics activities in relation to whether or not they engage in logistics activities

Whether there are differences in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics activities in relation to whether or not they engage in logistics activities were checked using a one-factor multivariate ANOVA.

Table 11 shows the descriptive statistics for the variable whether or not they are engaged in logistics activities in percentage on the sub-sample of respondents engaged in logistics activities (N=24).

Table 11. Descriptive measures of the percentage of respondents engaged in logistics work

% engaged in logistics business	N	M	SD	SEM
Low	0,21422	5	1,4800	0,40222
Middle	0,10274	15	1,3588	0,32542

Tall	0,15882	4	1,7900	0,29544
Total	0,09855	24	1,4974	0,38142

N - number of respondents, M - average (arithmetic mean), SD - standard deviation (deviation), SEM - Standard Error of the Mean

The obtained results of the research are shown in Table 12. In this research, the degree of influence of IC reporting on SCI in MTI is a numerical variable, and whether or not they are engaged in logistics business in percentage is a categorical variable.

Table 12. The difference in the degree of impact of IC reporting on SCI in MTI in relation to the % engaged in logistics business

Relation	rc χ^2	df	M	F	p
sum score x % engag. logis.	0,378	2	0,189	1,121	0,325

rc χ^2 - value of given statistic, df - number of degrees of freedom, M - average, F - statistic, p - level of significance

By applying a single-factor multivariate ANOVA, no statistically significant differences (p>0,05) were obtained in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics activities in relation to the variable of whether or not they engage in logistics activities in percentage (F = 1,121, df1 = 2, df2 = 21, Ho= groups do not differ). From this, it can be concluded that there is no difference in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics business in relation to whether they are engaged in or not engaged in logistics business in percentage.

7. CONCLUSION

The research results indicate that between the "experimental" and "control" groups of respondents there is a difference in the degree of influence of IC reporting on SCI in MTI (F = 11,434, df1 = 1, df2 = 46, p<0,05). From this, it is concluded that there are differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and "control" groups, i.e. that the respondents who deal with logistics business have the opinion that the impact is greater than the respondents who do not deal with logistics business.

The first research hypothesis was confirmed.

These results confirm the research findings that indicate that the degree of impact of IC reporting on SCI in MTI is higher among persons engaged in logistics activities than among the control group.

In the second research hypothesis, it is claimed that there are differences in the degree of influence of reporting on IC on SCI in MTI between the "experimental" and control groups in subjects of different gender. The results of the research show that there were no statistically significant differences (p>0,05) in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to gender F(1,44) =1,125 p>0,05. Analyzing the first question (does gender influence the degree of influence of reporting on IC on SCI in MTI), the result is that the variable does not influence the degree of influence of reporting on IC on

SCI in MTI. Analyzing the second question (does the factor of groups of respondents influence the degree of impact of reporting on IC on SCI in MTI), the result is that there is an influence of the variable of groups of respondents ("experimental" and control group) on the degree of impact of reporting on IC on SCI in MTI. Analyzing the interaction of these two factors, it can be concluded that there are no differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to gender, that is, the second research hypothesis is rejected.

The third research hypothesis related to the existence of a difference in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in subjects of different ages. In the research, no statistically significant differences ($p > 0,05$) were obtained in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to the age groups of the respondents. Analyzing the first question (does the factor of groups of respondents influence the degree of impact of reporting on IC on SCI in MTI), the result is that there is an influence of the variable of groups of respondents ("experimental" and control group) on the degree of impact of reporting on IC on SCI in MTI. Analyzing the second question (does the age factor influence the degree of influence of reporting on IC on SCI in MTI), the result is that there is no influence of the age variable on the degree of influence of reporting on IC on SCI in MTI. After analyzing the interaction of these two factors, it is concluded that there are no differences in the degree of influence of IC reporting on SCI in MTI between the "experimental" and control groups in relation to the age groups of the respondents, that is, the third research hypothesis is rejected.

The fourth research hypothesis refers to the existence of differences in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics activities in relation to whether or not they engage in logistics activities in percentage. The analysis of the obtained results concludes that there is no difference in the degree of influence of IC reporting on SCI in MTI among people who are engaged in logistics business in relation to whether or not they are engaged in logistics business in percentage ($F = 1,121$, $df_1 = 2$, $df_2 = 21$, $p > 0,05$). From this, it is concluded that there is no difference in the degree of influence of IC reporting on SCI in MTI among persons engaged in logistics business in relation to the percentage engaged in the mentioned business, i.e. that the percentage engaged in logistics business has no effect or influence on the degree of influence of IC reporting on SCI in MTI. The fourth research hypothesis is rejected.

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