# Structural Capital Development within Middle East University

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Abdel-Aziz Ahmad Sharabati
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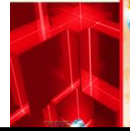
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# Structural Capital Development within Middle East University

Abdel-Aziz Ahmad Sharabati, Abdul-Naser Ibrahim Nour

Business College, Middle East University, Jordan
APharmaArt@Cyberia.Jo

## ABSTRACT

The aim of the study is to investigate the impact of Structural Capital (SC) on Middle East University's (MEU) Business Performance (BP). To fulfill the purpose of this study, practical data were collected from 167 participants out of about 3217 elements, by means of a questionnaire. Statistical techniques such as descriptive statistics, t-test, ANOVA test, correlation, multiple regressions and stepwise regressions were employed. To confirm the suitability of data collection instrument, a Kolmogorov-Smirnov (K-S) test, Cronbach's Alpha and factor analysis were used. The results of the study indicated a positive significant relationship between SC and MEU's BP. Moreover. The respondents believed that R&D is positively and directly affects the MEU' BP, and they do not believe that S&P and IPRs affect MEU's BP. Finally, empirical results indicated that there are strong inter-relationships and interactions among the three components of SC. The use of a single organization and/or a single industry study design limits its generalisability to other organizations and/or industries. The data is also limited to Jordanian organizations. Extending the research to other settings represent future research opportunities. SC is an important source of organizations' wealth and therefore it should be taken into serious consideration when formulating the MEU' strategy. This strategy formulation process can be enhanced by fully integrating SC indicators into management practices. The data suggest that a similar set of SC indicators could be developed for other organizations and industries whether government, public or private, profitable or non-profitable organizations. The current research may be considered as initiative study that highlights the effect of SC on MEU' BP. The results can provide the reference for further research about the relationship between SC and BP.

*Keywords*: **Structural Capital (SC), Systems and Programs (S&P), Research and Development (R&D), Intellectual Property Rights (IPRs), Middle East University (MEU), Business Performance (BP).**

## 1. Introduction

Among scholars, researchers and practitioners there was neither consensus about structural capital (SC) or organizational capital (OC) definition and classification, nor agreement about its measurement indicators and management methods. However, almost there was an agreement among them about the effect of SC on organizations' business performance (BP). While, some scholars, researchers and practitioners considered SC and OC

have same meaning, others consider them as different entities. The current research considered them as same and used them interchangeably.

Some authors viewed SC as organizations infrastructure such as: Bontis (2001), Dunmore (2002) Chetty and Mearns (2012) defined SC as the hardware, software, databases, organizational structure, patents, trademarks and everything else that employees use to support their business activities and processes. Yuen (2002) described SC as the infrastructure or organizational capabilities to meet market requirements. Sundac and Krmpotic (2009) and Pulic et. al. (2009) stated: SC is the supporting infrastructure of human capital. Kong and Thompson (2009) said: SC includes all databases and storage systems which support human capital in the development of efficient practice, which increases organizational performance. Shawyun (2010) described OC as organization's capability and capacity set, which includes: Organization aspirations and mission, leadership, governance framework, management practices, organizational skills and operations and organizational structure and culture. Hoyer (2011) referred OC to the infrastructure of an organization to provide a platform for employees to release their human capital. Moustaghfir (2012) added: SC is organizational infrastructures, and processes which do not depend on key staff. Bandgar (2012) pronounced: SC is everything in an organization that supports employees in their work. Asadi (2012) claimed: SC can be viewed as anything which exists in the organization and support the employees in their tasks. Wu (2012a) said: OC constitutes from: culture, leadership, alignment and team work. Purgailis and Zaksa (2012) stated: SC includes a corporate culture, management processes, databases, organizational structure, patents, trademarks and financial relations. Darvish et. al. (2012) mentioned: OC consists of culture, leadership, staff coordination, teamwork and knowledge management. Carvajal et. al. (2012) stated: OC is the set of formal and informal intangibles that structure an organization's activity. Torres and Teran (2012) added: SC that is related to the formal and informal organizational processes. Hadjali et. al. (2013) viewed OC as the set of assets that allow the organization's creative ability.

Other authors viewed SC as mechanisms, systems, programs and procedures such as: Gottschalk (2005) indicated: SC is including systems, networks, cultures and values. Tseng and Goo (2005) stated: OC includes information system, operation process and organizational culture. Ntalakas et. al. (2006) declared: SC is the organizational processes and databases. Georgescu and Chirita (2010) said: SC includes strategy and organizational culture, structures and systems, organizational routines and procedures. Eccles et. al. (2010) defined OC as systems, procedures, protocols and codes that enable work to be accomplished at continuously higher levels of productivity. Baron (2011) added: OC includes the firm's policies and procedures. Liu (2011) defined SC as the supportive mechanism by which employees may achieve optimum job performance. Mehralian et. al. (2012) stated: SC comprises mechanisms and structures, which support employees. MaCerinskiene and Survilaite (2012) referred OC to procedures, routines and management styles that are created in an organization. Karami and Vafaei (2012) pronounced: SC is the routine of the process system. Patrizia (2012) indicated: OC is structures, processes and technologies used by the firm; this also includes the organizational culture. Ahuja and Ahuja (2012) said: SC refers to the organization structures, systems and processes that enable an organization to exploit the

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intellectual capital. Finally, Chen and Lee (2012) defined SC as a company's overall system/procedures for problem-solving and value creation.

Another group of authors and scholars related SC to knowledge management such as: Bontis (2002) said: SC is the knowledge embedded within the routines of an organization. Subramaniam & Youndt (2005), Baron & Armstrong (2007) and Zhai & Liu (2010) defined OC as embedded or institutionalized knowledge and codified experiences residing within an organization. Gonzalez (2008) stated: SC concerns structured knowledge. Cervi (2011) said: The concept of OC focuses on the knowledge owned by the organization. Bhasin (2012) indicated: SC is the ability to transform knowledge and intangible assets into wealth creating resources. Bhasin (2012) defined SC as a firm's supportive structures for knowledge creation and deployment. Massaro et. al. (2012) claimed: SC creates knowledge integration and supports the creative process. Finally, Zargar et. al. (2012) said: SC influences knowledge creation, acquisition, application, protection and conversion.

Fourth group of scholars and authors considered R&D and intellectual property as the core of SC such as: Srivihok and Intrapairot (2004) said: SC consists of process technology and IT penetration, intellectual property, organization structure and business philosophy. European Commission (2006) stated: OC contains R&D activities, the organizational routines, procedures, systems, databases and intellectual property rights of the company. Samiloglu (2006) added: SC is made up of patents, intellectual properties, databases, information technologies of the company. Lupu (2009) mentioned: SC is made up of intellectual assets, organizational systems, processes, key relations and capacity to innovate. Remus (2012) elaborated: SC is made up of patents, models, administrative systems and information technology. Mahmood and Abdul-Wahid (2012) pronounced: SC includes patents, copyrights, and information-age assets such as data bases and software. Janosevic and Dzenopoljac (2012) claimed: SC entails components of internal corporate structure: corporate culture, trademarks, patents, software, copyrights, databases, and management processes. Bhasin (2011) suggested: SC is the intellectual property, methodologies, software, documents, and other knowledge artifacts. Finally, Lennox (2012) declared: SC is the enabler that facilitates the creativity and innovativeness of HC.

Anyway, there is consensus among scholars, researchers and practitioners about that: SC is owned by organizations and remains when employees leave at the end of day. Grembergen (2004) said: SC is organizational knowledge that is left when people go home. Cvrtila and Kuna (2006) stated: SC consists in every immaterial factor that stays within an organization when the employees leave at the end of a working day. Lee (2010) mentioned: OC is the sum of all assets pertaining to the firm which make the creative ability of the organization possible. Almasi et. al. (2010) proclaimed: SC belongs to the organization itself rather than individuals. Gabriela et. al. (2012) pronounced: SC consists of all remaining elements of the organization after the leaving of the employees. Barrett (2012) clarified: OC is owned by the organization. Molodchik et. al. (2012) reinforced: SC remains when the employee leaves the company. Zarandi et. al. (2012) concluded: SC is the use of the part of the intellectual capital that is owned by the company.

In general, Authors, scholars and practitioners did not have unified definition or classification regarding SC components, some of them considered SC and OC as same and used them interchangeably, while others considered OC as a part of SC. Skandia (1997) and

Bratianu & Orzea (2012) stated: SC is comprised of customer capital and OC. OC is divided into innovation capital and process capital. Wu (2012b) classified SC into innovation capital and process capital. Pablos (2006), Ammann (2012) and Castro & Verde (2012) divided SC into OC and technological capital. Sharabati et. al. (2010) categorized SC into: "Systems & programs", "research & development" and "intellectual property rights". This classification will be used throughout the current study.

In summary SC is an intangible assets; it represents organizational knowledge; it is owned by the organization; it can be reproduced, shared and traded with other organizations; it is everything that's left behind when the human capital walks out at the end of the day; finally, it can be classified into systems and programs, research and development and intellectual property rights.

Finally, there was neither agreement upon SC measurements indicators nor unified view about SC management methods. Dunmore (2002) stated: SC measurement is a hot topic because of the changing nature of the economy and the evaluation of OC. Santalo (2004) said: The task of measuring OC represents a considerable challenge. Draca et. al. (2006) concluded: There is a need for much greater understanding of the interactions between the technological capital and OC of firm performance. Poland Ministry of Economy (2012) reported: Development of intellectual capital requires spending on HC and increasing the SC resources i.e. infrastructure of domestic education and innovation systems, such as research and development units and institutions protecting intellectual property.

In the current fast evolving economical situation, there is an urgent need to define, identify, measure, manage and develop the organizations' SC. Therefore, the aim of this study is to measure and evaluate SC at MEU and determine its effect on MEU's business performance.

## 2. Literature Review

Almost all studies and researches confirmed the effect of OC or SC on organization's BP. Atkeson and Kehoe (2002) found: Nearly half of output in the U.S. manufacturing sector can be attributed to OC. Tseng and Goo (2005) proved: A significant and positive relation between OC and performance. Castro et. al. (2005) indicated: OC has a highest potential for sustaining competitive advantage. Lev and Radhakrishnan (2005) concluded: OC makes a substantial contribution to the firm's market share and growth. Black and Lynch (2005) stated: OC has been shown to raise productivity and to raise stock market value. Chen et. al. (2005) presented: R&D expenditure may capture additional information on SC and has a positive effect on firm value and profitability. Cabrita and Bontis (2008) concluded: SC has strong relationship with organization's performance, and strongly affects organization's performance. Yang and Lin (2009) showed: Among IC components, OC was having highest correlation value with organizations' performance. Maditinos et. al. (2009) found: SC has a positive relationship to BP in both industry types Service and non-service industries. Tronconi and Marzetti (2010) showed: There is strong effect of OC on firm performance. Yu et. al. (2010) concluded: SC has an effect on market valuation, profitability and general BP in Hong Kong companies. Rehman et. al. (2011) indicated: SC was having a significant relation with financial performance of Modaraba companies. Holme and Rangel (2011) revealed: OC

can influence schools' ability to respond to external policy demands. Santoso (2011) concluded: There is a week relationship between SC and return on assets. Ahmad and Mushraf (2011) emphasized: There is positive relationship between SC and businesses performance. Uadiale and Uwuigbe (2011) showed: Intellectual capital components have positive and significant relationship with the performance of business organizations in Nigeria. Rodrigues et. al. (2011) indicated: SC positively and directly influences the organization's management innovativeness. Kamaluddin et. al. (2011) proposed: SC has indirect relationship with organization effectiveness. Pare et. al. (2011) found: OC affects the entrepreneurial adventure. Ngugi et. al. (2012) showed: There is a significant influence of SC on the growth of SMEs in Kenya. Gilaninia and Matak (2012) concluded: There is a significant relationship between amount of SC dimension and business enterprises financial performance in Guilan province. Aminbeidokhti and Darvishkhademb (2012) found: There is positive relationship between SC and human capital and a positive relationship between SC and customer's capital. Djilali et. al. (2012) concluded: The relationship between SC and performance become statistically significant in Algerian industries. Rahman (2012b) indicated: Companies with greater human and SC efficiency have proportionally higher productivity, profitability, and market value and hence overall better financial performance. Li et. al. (2012) found: Strong relationship between OC and competitive advantage.

Mahmood and Abdul Wahid (2012) revealed: Significant relationships exist between SC and bank performance. Amri and Abdoli (2012) found: There is a positive relationship between the index of the SC efficiency and the return on assets ratio and the return on equity ratio. Allameh et. al. (2012) showed: SC has positive and significant effect on learning and growth, and BP. Alipour (2012) found: The relationship between SC and profitability was strong, and between SC and return on assets was also strong. Roman and Jana (2012) showed: A statistically significant correlation between OC and return on equity, as well as between OC and return on assets. Novas et. al. (2012) indicated: A positive and significant direct effect of SC on performance. Chen (2012) found: There is correlation between SC innovation indicators and investments in R&D. Zehri et. al. (2012) showed: Only SC has a significant and positive relationship with profitability measures. Mehdivand et. al. (2012) indicated: SC has only indirect effect on Iranian Nano-Businesses performance through entrepreneurial orientation. Khan et. al. (2012) concluded: SC has significant impact on financial performance. Rahman (2012a) indicated: Companies with greater SC efficiency tend to have greater positive changes in share price and better financial performance. Lalbar et. al. (2012) found: Firms with a higher efficiency coefficient of the SC has a higher ratio of the market to book value. Nejadirani et. al. (2012) showed: SC has direct effects on the performance of taxation offices in North Khorasan Province. Basuki and Kusumawardhani (2012) revealed: SC Efficiency significantly influences the firms' market valuation, profitability and the overall performance of pharmaceutical industry. Blanco (2012) suggested: In China, Japan, UK and US there was a strong relationship between the proxy of OC and the measures of future performance. Darvish et. al. (2013) indicated: There is a positive relation between SC and learning capabilities (0.355).

At the end, very few researches and studies concluded that: there is no significant effect of SC on organization's BP or SC negatively affects organization's BP such as: Mosavi et. al. (2012) indicated: Companies with greater SC efficiency do not main it should have higher

ratios of market-to-book value or have better financial performance. Ahmadi et. al. (2012) concluded: SC has a negative significant relationship with learning capability and absorptive capability had a positive relationship with transformative capability.

In modern economy, SC is very curtail for organization's sustainability, therefore each and every organization should measure and manage its SC to remain competing in the current highly competitive market. Therefore the aim of this study is to investigate the effect of SC on MEU's BP, consequently to provide sound recommendations regarding SC to decision makers.

## 3. Study Purpose and Objectives

This study investigates the effect of SC on the MEU's BP. More specifically, this study intends to answer the following question: Is there a direct impact of SC elements (Systems & Programs, Research & Development and Intellectual Property Rights) on MEU's BP? The main objective of this research is to provide sound recommendations about performance measurement within SC context by identifying and defining the main attributes of quality and productivity of SC, i.e. to point out critical factors of SC and find suitable ways for SC measurement and management.

### 3.1 Study Importance and Scope

The current study presents the necessary components of SC definitions. A better understanding of the effect of SC elements on the MEU's BP draws conclusions that can be beneficial not only for MEU but also to other organizations, institutions and policy makers. The content also may be of an interest to academic studies related to the reporting and decision making concerning SC. The current study might be considered as initiative that presents the effect of SC on MEU's BP in Jordan, and it may be an initiative study that investigates the relationship between SC and Universities' BP in Arab countries. If this study is put to use in the near future, it could present an important cornerstone that facilitates cross-disciplinary dialogue and hopefully reinforce a research field of SC in Jordan. This research is also an important one, in terms of the analysis of the situation of SC in Jordanian organizations, as well as in determining some of the relevant SC indicators used by those organizations.

### 3.2 Problem Statement

There was neither agreement upon SC measurements indicators nor unified view about SC management methods. At the same time, the problem of defining, identifying, measuring, managing and developing SC is not limited to one organization, industry, or country, but it is a worldwide problem. Dunmore (2002) stated: SC measurement is a hot topic because of the changing nature of the economy and the evaluation of OC. Santalo (2004) said: The task of measuring OC represents a considerable challenge. Draca et. al. (2006) concluded that there is a need for much greater understanding of the interactions between OC of firm performance. Accordingly, the purpose of this research is to investigate the effect of SC elements on MEU's BP, through examining the employees and students' perceptions regarding significance and potential use of SC indicators to leverage MEU's BP.

### 3.3 Problem Elements

Based on the mentioned above problem statement, the study problem can be perceived by having detailed and scientific answers to the following questions:

**Main question:** 1. Is there a direct impact of the SC on MEU's BP?

According to the SC elements the main question can be further divided into three questions, as follows:

1.1. Is there a direct impact of systems and programs variable on MEU's BP?

1.2. Is there a direct impact of research and development variable on MEU's BP?

1.3. Is there a direct impact of intellectual property rights variable on MEU's BP?

### 3.4 Study Hypotheses

Based on the mentioned above problem statement and its elements (questions), the following hypotheses can be developed:

**Main Hypothesis**

H0: SC variables do not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

According to SC elements the main hypothesis can be further divided into three hypotheses:

H0.1:S&P variable does not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

H0.2:R&D variable does not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

H0.3:IPRs variable does not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

### 3.5 Study Model

According to SC definitions, the current study classified SC into three elements: Systems & Programs, Research & Development and Intellectual Property Rights. As shown in figure (1).
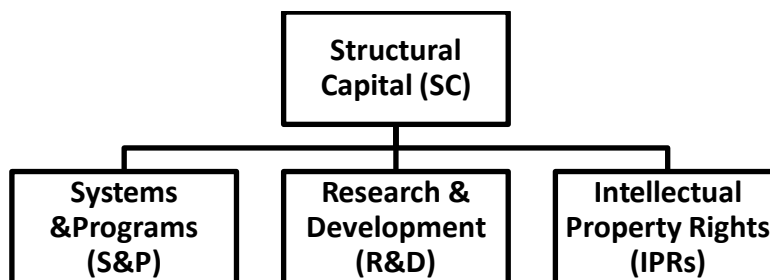


Fig. 1: Study Basic Model

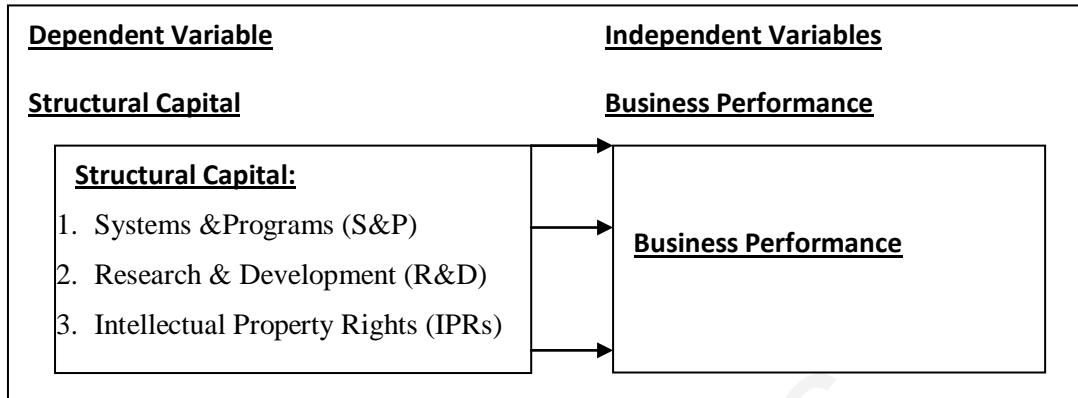The current research studies the effect of SC variables on MEU's BP as shown in the study model figure (2).



Fig. 2: Study Model

## 4. Data Collection Methods and Procedures

### 4.1 Study Design

The current study is considered as a casual study. It aimed at investigating the cause/effect relationship between SC elements and MEU's BP. The data that have been used for fulfilling the purposes of the study can be divided into two groups: secondary and primary data. Secondary data were collected from university annual reports, journals, books, researches, thesis, dissertations, articles, working papers, and the Worldwide Web. Primary data flowed to the researchers from expert interviews, content analysis, panel of judges, and the survey. A questionnaire was designed and developed in contrast with hypotheses. Then the questionnaire was validated through expert interviews and panel of judges. Practical data were collected from MEU staffs and students. The collected data were verified through the SPSS 20.

**Population, Sample and Unit of Analysis:** The Middle East University (MEU) is a Jordanian private university inaugurated its first phase on June 30, 2005. At the time of the study, the total number of its staffs were about 200 (Academics and Administrative Staffs) and about 3017 students (Master and Bachelor), the entire population was targeted to explore the topic of SC, thus negating any need for sampling. The survey unit of analysis was composed of all Academics, Administrative staffs, and Master & Bachelor students in MEU.

**The Questionnaire:** One of the main tools in actualizing a research project is the development of a tested instrument. Initial items to measure various constructs were developed depending on prior researches. With the help of experts the questionnaire was designed and developed in contrast with hypotheses and research model. Then the questionnaire was validated through expert interviews and a panel of judges.

**Questionnaire Variables:** Independent variables (SC): Through literature review, the researcher has identified three important independent variables of SC that contribute to MEU'

BP: Systems &Programs, Research & Development and Intellectual Property Rights. Each was tested by 7 questions. Dependent variable of the study is related to MEU' BP. BP was measured through the following 10 indicators: industry leadership, future outlook, overall response to competition, success rate in new product launches, overall BP and success, employee productivity, process (transaction) productivity, sales growth, profit growth, company's market valuation (stock value). All variables were measured by five-point Likert-type scale to tap into the individual's perceptions, ranging from value 1 (strongly disagree) to value 5 (strongly agree) used throughout the questionnaire.

## 4.2 Data Collection and Analysis

Questionnaires were delivered to 220 out of about 3217 staffs and students. This resulted in sample rate of about 7% of the total population. The researcher gathered only 180 questionnaires. The actual number of questionnaires analyzed was only 167 (31 Academics, 30 administrative staffs, 61 Master and 44 Bachelor students) representing 5% of the total unit of analysis.

**Normal Distribution (Kolmogorov-Smirnov Z Test):** Table (1) shows that all the independent and dependent variables are normally distributed because significance level was more than 5 percent (Bollen et. al. 2005) and Sharabati et. al. (2010).

Table 1: Normality Test: One-Sample Kolmogorov-Smirnov (Z) Test

| Variables | (K-S)Z | Sig. |
|-----------|--------|------|
| S&P | 1.095 | 0.182 |
| R&D | 0.874 | 0.430 |
| IPRs | 1.049 | 0.204 |
| SC | 1.019 | 0.250 |
| BP | 0.794 | 0.554 |

**Reliability Test:** Bontis (2001) stated that Alpha coefficients above 0.7 are accepted, while Bollen et. al. (2005) and Sharabati et. al. (2010) said: If Alpha Coefficients are below 0.60, they should be removed. Table (2) shows that Cronbach's Alpha coefficients were registered acceptable; because Cronbach's Alpha results were between 0.768 and 0.915.

Insert Table 2: Cronbach's Alpha Research Variables

| Variables | Alpha |
|-----------|-------|
| S&P | 0.768 |
| R&D | 0.855 |
| IPRs | 0.880 |
| SC | 0.915 |
| BP | 0.847 |

**Validity:** Two methods were used to confirm content validity: First, multiple sources of data were used to develop and refine the model and measures. Then, factor analysis (Pearson's Principal Component Analysis) was carried out for all items included in the questionnaire. Tables (3) show that all dependent and independent variable items were valid, since their factor loading values were more than 0.4. This result matches with previous

studies, such; as Bontis (2001), Bollen et. al. (2005), Bin Ismail (2005) and Sharabati et. al. (2010).

Table 3: Factors Loading for SC & BP Variables

| SC & BP Variables | Factor 1 | Extraction |
|---|---|---|
| S&P | 0.814 | 0.663 |
| R&D | 0.881 | 0.776 |
| IPRs | 0.842 | 0.709 |
| SC | 0.988 | 0.976 |
| BP | 0.627 | 0.393 |

Extraction Method: Principal Component Analysis

## 5. Data Analysis and Results

### 5.1 Study Variables Analysis:

**Structural Capital Variables:** Table (4) shows that the average means of respondents' perception about the implementation of SC variables were ranging from 2.80 to 2.94, with standard deviation that ranges from (0.701 to 0.773). Such results indicate that there is an agreement on weak implementation of SC variables. The overall result indicates that there is no significant implementation of the SC variables among MEU, where the total average mean is 2.85 with standard deviation 0.633 and (t=-2.980 < 1.645).

Table 4: Mean, Standard Deviation and One-Sample T-Test Results for SC Variables.

| SC Variables | Mean | Std. deviation | T value | T tabulated |
|---|---|---|---|---|
| S&P | 2.80 | 0.701 | -3.641 | 1.645 |
| R&D | 2.94 | 0.773 | -0.930 | 1.645 |
| IPRs | 2.82 | 0.742 | -3.218 | 1.645 |
| SC | 2.85 | 0.633 | -2.980 | 1.645 |

Tables (5,6&7) showed that the average means of respondents' perception about the implementation of S&P variable were ranging from 2.61 to 3.13, with standard deviation that ranges from (0.978 to 1.245). While for R&D variable were ranging from 2.82 to 3.11, with standard deviation that ranges from (0.985 to 1.111). Finally, for IPRs variable were ranging from 2.68 to 2.90, with standard deviation that ranges from (0.915 to 1.031). Such results showed that there is a varied agreement on the implementation of S&P, R&D and IPRs variables items. The results also indicated that there is no significant implementation of the S&P, R&D and IPRs variables, where its total average mean is 2.80 with standard deviation 0.701 and (t=-3.641 < 1.645), and R&D total average mean is 2.94 with standard deviation 0.773 and (t=-0.930 < 1.645), and IPRs total average mean is 2.82 with standard deviation 0.742 and (t=-3.218 < 1.645).

Table 5: Mean, Standard Deviation and One-Sample T-Test Results for S&P Variable Items.

| No. | Items | Mean | Std. Deviation | T | T |
|-----|-------|------|----------------|---|---|
| 1 | Succession training programs | 2.73 | 0.978 | -3.559 | 1.645 |
| 2 | Cultural atmosphere supportive & | 3.13 | 1.245 | 1.368 | 1.645 |
| 3 | Comprehensive recruitment programs | 2.98 | 1.050 | -0.221 | 1.645 |
| 4 | Reward system related to performance | 2.63 | 1.038 | -4.549 | 1.645 |
| 5 | Support of skills & education development | 2.77 | 0.981 | -3.075 | 1.645 |
| 6 | Employees influence over decisions | 2.61 | 1.102 | -4.563 | 1.645 |
| 7 | Not bureaucratic nightmare | 2.76 | 1.173 | -2.639 | 1.645 |
|  | Mean total S&P | 2.80 | 0.701 | -3.641 | **1.645** |

Table 6: Mean, Standard Deviation and One-Sample T-Test Results for R&D Variable Items

| No. | R&D Items | Mean | Std. | T | T |
|-----|-----------|------|------|---|---|
| 8 | Research leader | 3.11 | 1.111 | 1.324 | 1.645 |
| 9 | Continuous development of work processes | 3.01 | 0.985 | 0.079 | 1.645 |
| 10 | Continuously develops and Re-organizes | 2.98 | 1.050 | -0.221 | 1.645 |
| 11 | Adopts latest scientific & technical | 2.90 | 1.079 | -1.219 | 1.645 |
| 12 | Systems & programs support innovation | 2.82 | 1.072 | -2.166 | 1.645 |
| 13 | Appropriate & adequate R&D budget | 2.84 | 1.066 | -1.960 | 1.645 |
| 14 | Board trust & support R&D | 2.95 | 1.029 | -0.602 | 1.645 |
|  | **R&D** | **2.94** | **0.773** | **-0.930** | **1.645** |

Table 7: Mean, Standard Deviation and One-Sample T-Test Results for IPRs Variable Items

| No. | IPRs Items | Mean | Std. | T | T |
|-----|-----------|------|------|---|---|
| 15 | Sets clear IPRs strategies & procedures | 2.78 | 0.970 | -2.871 | 1.645 |
| 16 | Monitors IPRs portfolio | 2.87 | 0.915 | -1.860 | 1.645 |
| 17 | Pursues a multiple strategy of licensing | 2.84 | 0.946 | -2.208 | 1.645 |
| 18 | Encourage & reward creation | 2.72 | 0.944 | -3.855 | 1.645 |
| 19 | IPRs considered for value creation | 2.90 | 1.031 | -1.201 | 1.645 |
| 20 | Maximum utilization of IPRs to maximum | 2.92 | 1.014 | -1.068 | 1.645 |
| 21 | High no. of IPRs | 2.68 | 0.990 | -4.223 | 1.645 |
|  | IPRs | 2.82 | 0.742 | -3.218 | 1.645 |

**Business Performance Indicators:** Table (8) shows that the average means of the respondents' perception about the role of BP indicators were ranging from 3.01 to 3.59, with standard deviation that ranges from (0.817 to 1.011). The result indicates that there is a significant role of BP indicators, where its total average mean is 3.25 with standard deviation 0.602 and (t=5.414 > 1.645).

Table 8: Mean, Standard Deviation and One-Sample T-Test Results for BP Indicators

| No. | Statement | Mean | Std. | T value | T tabulated |
|---|---|---|---|---|---|
| 22 | Industry leadership | 3.07 | 0.967 | 0.961 | 1.645 |
| 23 | Future outlook | 3.47 | 1.011 | 5.972 | 1.645 |
| 24 | Overall response to competition | 3.22 | 0.906 | 3.075 | 1.645 |
| 25 | Success rate in new launches | 3.24 | 0.920 | 3.365 | 1.645 |
| 26 | Overall BP | 3.28 | 0.967 | 3.680 | 1.645 |
| 27 | Employee productivity | 3.01 | 0.829 | 0.187 | 1.645 |
| 28 | Process productivity | 3.03 | 0.817 | 0.473 | 1.645 |
| 29 | Sales growth (No. of students) | 3.37 | 0.959 | 4.921 | 1.645 |
| 30 | Profit growth | 3.59 | 0.995 | 7.618 | 1.645 |
| 31 | University market valuation | 3.26 | 0.891 | 3.732 | 1.645 |
|  | **Mean Total BP** | **3.25** | **0.602** | **5.414** | **1.645** |

## 5.2 Relationships between the Study Variables

Before testing the hypotheses, Pearson correlation (r) was carried out to test the correlation among the responses of SC variables, then between them and BP indicators. The table (9) shows that the SC variables significantly and strongly related to each other, and to MEU' BP.

Insert Table 9: Pearson's Correlation (r) Among Independent Variables and With Dependent Variable

|  | S&P | R&D | IPRs | SC | BP |
|---|---|---|---|---|---|
| **S&P** |  | 0.604** | 0.545** | 0.828** | 0.382** |
| **R&D** |  |  | 0.650** | 0.884** | 0.485** |
| **IPRs** |  |  |  | 0.856** | 0.411** |
| **SC** |  |  |  |  | 0.499** |
| **BP** |  |  |  |  |  |

*Correlation is significant at 0.01 levels (2-tailed)

Pearson correlation matrix table (9) shows that the relationships between the SC variables (S&P, R&D and IPRs) with MEU's BP are strong, where r equals 0.382, 0.485 and 0.411 respectively. For the SC r equals 0.499 indicates a very strong relationship between the SC and MEU's BP. The matrix also shows that the relationships among the SC variables are strong, where r ranges from 0.545 to 0.650.

## 5.3 Hypotheses Testing

To test hypotheses, a multiple regression analysis was used to analyze the relationship between the SC variables and MEU's BP. Regression analysis is robust against non-normality, multi-collinearity and independence of error, therefore, applicable in the case at hand.

**Multi-collinearity:** Table (10) shows that VIF value is less than 10 and the Tolerance value is more than 0.2. This indicates that there is no Collinearity within the independent variables of the study.

Table 10: Multi-Collinearity Test for Main Hypothesis

| SC Variables | Multi-Collinearity Statistics | |
|---|---|---|
| | Tolerance | VIF |
| S&P | 0.595 | 1.682 |
| R&D | 0.489 | 2.045 |
| IPRs | 0.542 | 1.847 |

Dependent Variable: BP

**Independence of errors:** Durbin Watson test is conducted, where (d=2.01), which approximately equals two. This indicates that the residuals are not correlated with each other; therefore, the independence of errors is not violated.

## 5.4 Multiple Regressions

The R square value is 0.343; therefore, the model is regarded as being suitable to be used for multiple regressions with the data.

Table 11: Results of Multiple Regression Analysis: Regressing SC Variables against BP

| Variable | r | $R^2$ | ANOVA F- Value | Sig. |
|---|---|---|---|---|
| SC Variables | 0.508 | 0.258 | 18.868 | 0.000 |

**Main Hypothesis:**

H0: SC variables do not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

Table (11) shows the results of the multiple regressions analysis that regress the three variables of SC together explained 25.8 percent of the variance, where ($R^2$ =0.258, F=18.868, Sig. =0.000). Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which states that the SC variables affect MEU's BP, at ($\alpha \leq 0.05$).

Table (12) shows the significant effect of each SC variable within the SC. It shows that the R&D variable has the highest effect on MEU's BP, where (Beta=0.330, sig.=0.000), while the other two (S&P and IPRs) variables do not have significant effect where (Beta=0.107, sig.=0.223) and (Beta=0.138, sig.=0.134) respectively.

Table 12: Un-standardized and Standardized Coefficients of Multiple Regression Model for SC Variables

| SC Variables | Un-standardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t-value | p |
| (Constant) | 1.922 | 0.189 | | 10.191 | 0.000 |
| S&P | 0.092 | 0.075 | 0.107 | 1.223 | 0.223* |
| R&D | 0.257 | 0.075 | 0.330 | 3.423 | 0.001* |
| IPRs | 0.112 | 0.074 | 0.138 | 1.506 | 0.134* |

*Calculate is less than 0.05*

The relationship between the dependent and independent variables derived by this model can thus be expressed as:

*Structural capital = 1.922 + 0.107 (S&P) + 0.330 (R&D) + 0.138 (IPRs)*

**Sub-hypothesis 1:**

H0.1:S&P variable does not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

Table (12) shows that S&P variable does not have a direct significant impact on the MEU's BP, where (Beta=0.107, sig.=0.223). Since (t=1.223, $p > 0.05$), the null hypothesis is accepted, which indicates that the S&P variable does not have a direct effects on MEU's BP, at $\alpha$ =0.05.

**Sub-hypothesis 2:**

H0.2:R&D variable does not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

Table (12) shows that there is a positive direct significant effect of the R&D variable on the MEU's BP, where (Beta=0.330, sig.=0.001). Since (t=3.423, $P > 0.05$), the null hypothesis is rejected and the alternative hypothesis is accepted, which indicates that the R&D variable affects the MEU's' BP, at $\alpha$ =0.05.

**Sub-hypothesis 3**

H0.3:IPRs variable does not have a direct impact on MEU's BP, at ($\alpha \leq 0.05$).

Table (12) shows that IPRs variable does not have a direct significant impact on the MEU's BP, where (Beta=0.138, sig.=0.134). Since (t=1.506, $P > 0.05$), the null hypothesis is accepted, which indicates that the IPRs variable does not affect the MEU's BP, at $\alpha$ =0.05.

**3.5 Stepwise Regression**

From table (13), the first stepwise regressions model (ANOVA) shows the importance of the S&P variable, where ($R^2=0.235$, $F=50.673$, $Sig.=0.000$). The R&D variable alone explains 23.5% of the variance in the MEU's BP. While, other variables do not add any explanation power to R&D variable, therefore stepwise regression excluded them and considered them as excluded variables.

Table 13: Stepwise Regressions (ANOVA) for SC Variables

| Model | r | $R^2$ | F | Sig. | SC Variables |
|-------|-----------|-------|--------|-------|--------------|
| 1 | 0.485(a) | 0.235 | 50.673 | 0.000 | R&D |

Table (14) shows the relation between the SC variables and MEU's BP. The first stepwise regression model shows that there is a positive direct relation between the R&D variable and MEU's BP, where beta equals 0.485. While, the other two variables where excluded from stepwise regression because they do not add any explanation power to the first model. Such results indicate that the R&D variable is the only important variable, and has a direct positive impact the MEU's BP.

Table 14: Stepwise Regressions Model for SC Variables

|  | Model 1 | | | |
| SC Variables | Un-standardized Coefficients B | beta | t | Sig. |
| --- | --- | --- | --- | --- |
| Constant | 2.140 |  | 13.261 | 0.000** |
| S&P |  |  |  |  |
| R&D | 0.378 | 0.485 | 7.118 | 0.000** |
| IPRs |  |  |  |  |

*sig. <0.05*

## 6. Data Results Discussions

### 6.1 Structural Capital Variables

Results indicated that there is an agreement on weak implementation of SC variables. The overall result indicates that there is no significant implementation of the SC variables among MEU staffs. Results also showed that there is a varied agreement on the implementation of S&P, R&D and IPRs variables items. It seems that the MEU has low implementation of all SC variables. The results seem to suggest that either the respondents are unaware about the role of SC variables in MEU's BP, or they do not believe that SC is important for BP, or they believe that the MEU's management is not interested in developing SC. Respondents believe that the R&D variable is important, then IPRs and S&P. The mean of the current study result was (2.85), this result is contradicting with many previous studies results such as: Sofian et. al. (2004) rated (3.58), Bin Ismail (2005) rated (3.39), Salleh and Salamat (2007) rated (3.62), Yang andLin (2009) rated (3.58), Sharabati et. al. (2010) rated (3.06), Santoso (2011) rated (3.77), Ngugi et. al. (2012) rated (3.86), Djilali et. al. (2012) rated (3.52), Mahmood and Abdul Wahid (2012) rated (4.02), Li et. al. (2012) rated (3.48) and Mehdivand et. al. (2012) rated (3.35) and BP was (3.76). While the result is matching with Miller et. al. (1999) rated (2.80), Berglud et. al. (2002) rated (1.85) and Moslehi et. al. (2006) rated (2.23).

**Systems and Programs Variable:** The average mean of respondents' perception about the implementation of S&P was 2.80. The results indicated that there is no significant implementation of the S&P variable. It seems that the respondents are unaware about the role of the S&P in MEU's BP. Evidence seems to suggest that respondents have varied agreement about the implementation of the S&P variable items: The employees perceive that the MEU is bureaucratic, does not apply comprehensive recruitment programs, and the reward system is not related to performance. They perceive that there are no succession-training programs, and low upgrading skills and educational support. Moreover, they have low influence over decisions made. The organizations culture and atmosphere also are not supportive and comfortable. This may be due to the lack of management support, the owners' concern about short-term profit and high return; this also may be related to the culture of competition between individuals and universities. The above result is contradicting with many studies Bin Ismail (2005) and Sharabati et. al. (2010) study which rated (3.17).

**Research and Development Variable:** The average mean of respondents' perception about the implementation of R&D was 2.95. The results indicated that there is no significant implementation of the R&D variable. It appears that the respondents are either unaware about the role of the R&D in MEU's BP, or they do not believe that the R&D affect MEU's BP. Evidence seems to suggest that employees have a variable agreement on the implementation of the R&D variable items: The respondents perceive that the organizations' board has low trust in and support to R&D, and there is no appropriate and adequate budget for R&D. Furthermore, it seems that MEU does not have systems and programs to support innovation. It also does not continuously develop and re-organize itself around R&D, and it does not develop work processes continuously. Moreover, it does not follow up and adopt the latest scientific and technical development, and it is not a research leaders. Although, the MEU is heavily weighted with professional and technical staff, this may be due to the lack of the board support, and there is no strong relation between academic institutions and local industries (basic and secondary research). At the same time, R&D need high investment that might be not available and the return from R&D may come late or even do not come at all from some researches. Finally, it seems that the government policies, systems and programs do not support the resear R&D, which is considered as crucial for R&D. The above results are contradicting with Chen (2004), Bollen et. al (2005), and Sharabati et. al. (2010) study which rated (3.20).

**Intellectual Property Rights Variable:** The average mean of respondents' perception about the implementation of IPRs was 2.82. The results indicated that there is no significant implementation of the IPRs variable. It seems that MEU is neither aware of the role of the IPRs in MEU's BP, nor they believe that the IPRs affect MEU's BP. Evidence seems to suggest that the respondents have variable agreement on the implementation of the IPRs variable items. They agree on the fact that MEU has low implementation of all IPRs variable items: The MEU does not set clear strategies and procedures for IPRs, and it does not IPRs portfolio. Additionally, it does not pursue a multiple strategy of licensing IPRs. What is more, it does not encourage and reward creation. Moreover, IPRs are not considered for value creation. It also does not utilize IPRs to maximum level, and it does not have high number of IPRs. This may be due to the lack of MEU board support and misunderstanding the value of IPRs. IPRs need strong R&D department which most of the Jordanian universities do not have. The government policies, systems and programs seem to be not supportive. The above results are contradicting with Chen (2004), Bollen et. al (2005), and Gallego & Rodrygues (2005), however the result is matching with Sharabati et. al. (2010) which rated 2.80.

**Business Performance Indicators:** The average mean of respondents' perception about the implementation of BP indicators were 3.25. Results showed that there is an agreement among respondents about the role of BP. The result indicated that there is a significant role of BP indicators. Evidence seems to suggest an improvement in MEU's BP. Therefore, the MEU is directed and strongly leaning toward performance improvement, and the respondents are aware of the role of BP indicators. The current study results are in line with previous studies such as: Miller et. al. (1999) rated (3.02), Sofian et. al. (2004) study rated (3.20), Bin Ismail (2005) study rated (3.01), and Moslehi et. al. (2006) study rated (2.4), Sharabati et. al. (2010) study rated (3.58) and Mehdivand et. al. (2012) rated (3.76).

**Relationships between the Study Variables:** Pearson correlation matrix showed that the relationships between the SC variables: S&P, R&D and IPRs with MEU's BP are strong. The matrix also showed that the relationships among the SC variables are also strong. These results are supported by Bollen et. al. (2005) and Bin Ismail (2005), Moslehi et. al. (2006), Salleh & Salamat (2007) and Sharabati et. al. (2010).

## 6.2 Multiple and Stepwise Regressions

Results of the multiple regressions analysis showed that the SC variables directly and positively affect MEU's BP. This result is going in line with the following studies: Bollen et. al. (2005) and Bin Ismail (2005), Tseng and Goo (2005), Black and Lych (2005), Cabrita and Bontis (2008), Yang and Lin (2009), Maditinos et. al. (2009), Tronconi and Marzetti (2010), Yu et. al. (2010), Sharabati et. al. (2010), Rehman et. al. (2011), Ahmad and Mushraf (2011), Gilaninia and Matak (2012), Djilali et. al. (2012), Rahman (2012b), Allameh et. al. (2012)…etc. The current result is contradicting with Mosavi et. al. (2012) and Ahmadi et. al. (2012), they found negative relationship between SC and BP.

Result also showed that the R&D variable is the only variable has effect on MEU's BP, while, the S&P and IPRs variables do not have effect. The stepwise regressions supported the mentioned above results with little modification; model1 is the only model indicated that R&D variable was the most important, while the other two variables are excluded, because they do not add any explanation power over R&D. The result about the weak relationship between IPRs and BP is supported by Sharabati et. al. (2010).

## 6.3 Research Limitations/Recommendations

The use of a single organization and/or industry study design limits its generalisability to other organizations and/or industries. The data is also limited to Jordanian organizations; therefore, generalizing results of a Jordanian setting to other countries may be questionable. Extending the analyses to other settings represent future research opportunities, which can be done by the following ways: Further testing with larger samples within same industry is important, and including other industries will help mitigate the issue of generalizing conclusions on other organizations and industries. Moreover, further empirical researches involving data collection over diverse countries especially Arab countries are needed.

## 6.4 Contributions/Practical Implications

SC is an important source of organizations' wealth and therefore it should be taken into serious consideration when formulating the Jordanian Universities' strategy. This strategy formulation process can be enhanced by fully integrating SC indicators into management practices. Jordanian Universities should coordinate different perspectives of SC to improve MEU's BP and should assign scales for each of the three components of SC.

## 6.5 Contributions/Social Implications

The research makes significant theoretical and empirical contributions to literature regarding influence of SC on the MEU's BP. The research results might help both academics and practitioners to be more ready to understand the components of SC and provide insight

into developing and increasing them within their organizations. Finally, the data suggest that a similar set of SC indicators could be developed for other organizations and industries whether government, public or private, profitable or non-profitable organizations.

## 6.6 Expected Value

The current research may be considered as initiative study that highlights the effect of SC on MEU's BP. Moreover, it could be an initiative study that divided SC into three variables and focusing on the role of each variable on Universities' BP. The empirical results of this study built on the previous researches on the relationship between SC and organizations' BP. This study also extends prior research's viewpoint about the linear relationship between SC and organizations' BP with empirical evidence. The results can provide the reference for further research about the relationship between SC and BP.

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