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# Identifying The Relationship Between Intellectual Capital And Value Creation Of The Company Using Structural Equations Analysis- The Case Of Tunisia

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**Abstract:**
*With the importance of intellectual capital and the interactions of different components in determining the value of the company, it becomes essential for the company to develop a system of management and monitoring its evolution, in order to increase or improve the value of its various activities. In fact, the various components of intangible assets are related to each other and to the financial structure of the company. They correspond to the realization of the knowledge of employees' skills in their effects on the structure of the business and create value for it. In addition, the value is not produced not only by one of the components of intellectual capital, but also by their interaction. We developed a conceptual model linking the three components of intellectual capital with the value creation of the company; thus, we carried out a research field related to the Tunisian context. This is to test the hypotheses developed and present a model to explain the dynamics of intellectual capital and its impact on the value creation of the company, empirically validated. We validated the scales used for our global model using the analysis in principal component APC and the confirmatory factor analysis CFA. We tested the relationships between different variables of our model and validated the assumptions of our research. This part is divided into two; the first is the test of the structural model and the second is the test of the moderating effect of financial capital. The analysis is performed by the structural equation method rarely used in the field of management.*

**Keywords:** *Intellectual capital, value creation, human capital, organizational capital, customer capital, financial capital, structural equation models.*

**Introduction:**

During the last decade, studies on intellectual capital have continued to grow using different methods of analysis in different countries. Testing in terms of measurement and evaluation of intellectual capital grew. But it is still difficult to find an appropriate measure of intellectual capital. Several researchers (Edvinsson and Malone, 1997, Stewart, 1997; Sveiby, 2000) support the idea that traditional measures of corporate performance that are based on the classical principles of accounting can be unsuitable for the economy based on knowledge and expertise. They also argue that the use of traditional measures can lead investors to make inappropriate economic decisions.

Our study does not intend to measure the intangible assets of the company (financial and accounting approach), but to determine the relationships within the capital , on the one

hand , and the value creation of the company on the other side. We agree, therefore, the qualitative and strategic approach to the management of intellectual capital. This approach regards the contribution of intangible resources to develop a competitive advantage from the resources approach (resource -based view). Under this approach, the performance of the company depends on the effective and efficient use of its tangible and intangible assets. Thus, the development of a competitive advantage is based on the creation, protection, development of scarce resources which are the knowledge and skills (Roos and Roos , 1997). These resources are a key to strategic resources (Grant, 1996). Management of intellectual capital goes beyond the simple management of knowledge and intellectual property. It is interested in an increase and a parallel development of human, organizational and customer capital assuming a dynamic interaction between these three capitals.

Hence the apparent importance of the central hypothesis of our work suggests : The value of the company is no longer content just financial capital, but rather it is dependent on the dynamic interaction between the components of existing intellectual capital in the company. The importance of this capital needs to take into account new ways and tools for processing and evaluating in order to identify and manage it effectively. Thus, our research questions are as follows:

*What are the different relationships between the components of intellectual capital? And then, what is their impact on the value creation of the company?*

To answer these questions we have organized our article around four parts: First, we present a theoretical overview of our work; second we examine the construction of our theoretical model; third the process of construction and validation of our measurement scales will be processed, and finally, we analyze the methodology and the interpretation of the results.

## 1. Theoretical framework of the research:

The intellectual capital is gaining importance in the knowledge economy of today and plays a vital role in innovation, productivity growth and the performance and competitiveness of organizations. The intellectual capital may include the following areas: human resources, organizational structure and processes, research and development, technology and rights to intellectual property, consumer networks, and suppliers and software.

Management of intellectual capital is a field that uses the creativity and intelligence of people, new management methods, new information technologies, and new approaches to the organization post-industry in the new knowledge economy.

Various definitions have been given by researchers to the concept of CI. (ICM Gathering, 1995, Brooking, 1996, Bontis, 1996, Roos 1997, Stewart 1997, Bontis et al, 1999). Frustec and Marois (2006) explain that intangible capital can be defined by a single sentence: "It is the wealth of the company that does not read in the financial statements." In the company, there are stocks of liquid wealth (current assets), inventories of solid wealth (capital) and there is the intellectual capital stock which is the gas.

Petty and Guthrie (2000) argue that the most important definition in CI is the OECD (1999) which describes the CI as:

"The economic value of two categories of intangible assets of a firm are:

1-The organizational or structural capital,

2 - The human capital. "

Following the work of Edvinsson and Malone (1997), Stewart (1997), Sveiby (1997 ), it seems to be a compromise around the decortication of intangible capital into three components namely human capital , customer capital or a relational and organizational capital (although the content of each component is a little different from one author to another):

- Human capital for Men Company: individual skills, knowledge, experience...

- The organizational capital for the business systems organizations, information technology...

- The customer or relational capital relations with customers and external business partners.

Calvalcanti et al (2006) add a fourth dimension to the intangible capital which is the social capital. This is the set of networks of social relations that can benefit an individual. In business, organizational social capital is characterized by the associability (willingness and ability to implement joint projects) and trust.( Silem , Albertini et al , 2010).

Intellectual capital is present in three dimensions of business-or in one or other of these three dimensions, its staff, its structures and its customers. Studies by Bontis et al (2000), Moon and Kym (2006), Martinez and Torez (2006) and Hsu and Fang (2009) show that there exist interactions between the components of intellectual capital that lead to improving the performance of the company and, therefore, the value creation.

## 1.1. Model of creating value through intellectual capital:

We are used to calculate the value ratios favoring the interests of shareholders. However, value is created by employees and shareholders. It is present in an immaterial way, in the potential of the organization and employees, and is directed toward the customer. So we can say it passes from human capital through organizational capital to customer capital. For Pierrat and Martory (1996), the direction of increasing the value of the company following the increase of the degree of control , both spend purely human intellectual capital, structured intellectual capital (organizational capital in our case ) to the identified intellectual capital ( customer capital). Indeed, the value of employees' knowledge becomes the property of the company when it converts structured capital into identified capital. As it increases its control over the intangible element, it is appropriate for a growing share of its value. The organization has potential, the most important is intangible and present in the skills and expertise of its staff (Human Capital HC): This value is potential. It will then become materialized in the production process of the product-service through the activities of the company. Human capital is part of the organizational capital (OC) to create value. The purpose of the organization is to create value, human capital is the players who will create value and it is the recipient of the customer value creation.

The process of value creation puts in games two topics: the organization with staff and client, and an object: the product. It is the client who will give a judgment on the value, so the company must learn to look outside. As usual, it is the rate of sale that made human resources throughout the production process ultimately monetized and therefore measurable. In human capital the company will innovate. The production will be different from those of competitors, and therefore it will be attractive to consumers. The value here is created through the income provided by the sale of the product. It can also be created through proper positioning, a good image and a good reputation and customer loyalty. Human capital is the source of all the tacit knowledge; it is included in three different types of intangible assets: knowledge and skills, internal and external reporting and organizational capital.

Operation and use of the knowledge of the company rely heavily on expertise of its employees and their continued presence in the business. Beyond tangible formalized knowledge and archived knowledge of the business is an extremely volatile intangible resource. We realize that knowledge, just as detailed as it may be in the procedures and documents is not enough: the tasks that we have to perform under specific conditions of safety, quality, profitability, are not directly executables, under the same conditions, with new employees only equipped with these procedures and documents.

The platform of value by Edvinsson & Malone (1999) is located at the confluence of three resources : people , organization and customers. This is where it materializes new value created by the organization. Thus, we conclude from this platform that the value is not created by one of the components of intellectual capital but by their interaction, which is why the company should try to manage this interaction in order to convert its intangible capital to value.

Based on the dynamic model of knowledge creation of Nonaka and Takeuchi (1995), the platform of the value presented by Edvinsson and Malone (1999) , work and Pierrat Martory (1996) and those of Vincent and Mantana (2010) on the other side , we present a model for value creation in intangible capital. (See figure1).

We follow the methods of conversion of knowledge as the transfer of knowledge of human capital to human capital (tacit to tacit), human capital into organizational capital and relational capital into organizational capital (tacit to explicit). Externalization, structural capital to structural capital (from explicit to explicit), organizational capital to human capital (tacit to explicit) internalization. This can be done by reclaiming explicit by individuals' (OC to HC) knowledge, or learning from partners (CC to HC). Socialization through the dissemination of tacit knowledge (HC) or explicit (OC) to partners (CC).

Figure1: The model of creation of intrinsic value of intellectual capital
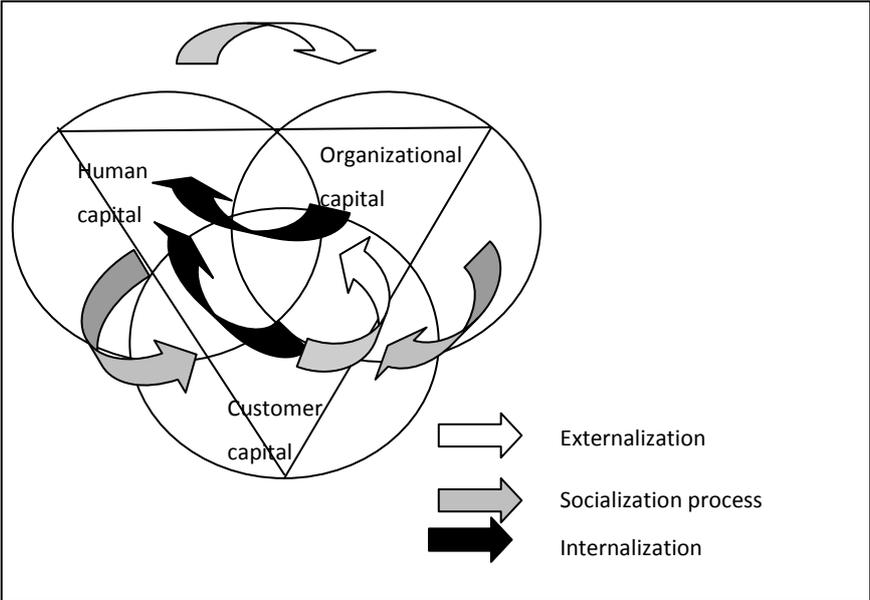
## 1.2. Analysis of the interactions of the various components of intellectual capital by the structural equation method:

The structural equation models are the methods of measuring the relationship between latent variables. They are techniques for specifying, estimating and evaluating models linear relationships between observables and unobservables. From the 80s, we started to use this technique in marketing research and consumer behavior. This new statistical approach has recently begun to be a preferred method of empirical research in operations management.

The structural equation model developed by Jöreskog and Sörbom (1989), can simultaneously introduce multiple variables to explain in a single analysis. It studied all theoretically-based causal relationships between independent variables and dependent variables, and it also discussed, in one analysis, and justified theoretically-linear relationships between the dependent variables; they are unidirectional or reciprocal. Rachma Shah and Susan Meyer Goldstein (2006) noted that research on operations management should focus more on structural equation models to take advantage of their potential. These models treat the latent variables statistically mainly through joint factor analysis and regression: factor analysis used to measure the latent variables and produce a model for measuring these variables. Regressions are intended as tests against the supposed effects between variables. They produce a causal model called linear structural relations system. From the 2000s, studies on intellectual capital and the use of structural equations have emerged. In the following, we will present four studies that have dealt with these methods in their analysis. The synthesis of these various researches is presented in Table1.

**Table1:** Using the method of structural equation modeling in the field of intellectual capital:

| Authors | Research questions | Country concerned with the study | Indicators for Measuring | Methodology | Results |
|---|---|---|---|---|---|
| **Bontis and al (2000)** | Relationship intangible assets with company's performance in two different areas | Malaysia 107 respondents (MBA students) | Shown in summary + original questionnaire (dimensional variables) | MES PLS technique | Validation of hypotheses: -All these studies have validated the existence of interaction between the various components of intellectual capital |
| **Moon andt Kym (2006)** | The interaction between the various components of intellectual capital | Korea 200 questionnaires from 50 companies manufacturing | Shown in summary (multidimensional variables) | MES on Amos | |
| **Martinez Torres (2006)** | The interaction between the various components of intellectual capital | Spain (university system) | Not specified (dimensional variables) | MES PLS technique | |
| **Hsu and Fang (2009)** | The mediating effect of organizational learning capacity between intellectual capital and new product development performance | Taiwan 123 companies design integrated circuits | not indicated (dimensional variables) | MES PLS technique | |

The four studies have used the method of structural equation to define the various existing relationships and measure the values of different types of capital. They all confirmed the hypothesis of the existence of interaction between the various components of intangible assets where there is a dynamic interaction in the company.

At this level, our contribution in this work is to take the results made in the four studies cited (by some additions deemed necessary) to prove the relevance and the importance of the results found in testing the model in the Tunisian context which is considered different. So according to the work of Bontis, we change the performance of the company by value creation. And in relation to the work of Martinez and Moon, we add another variable in the model. Our model is formed by latent variables that are not directly observable that we will try to measure from observable or manifest variables called indicators.

The research model examines several latent variables. It is preferable to use structural equation models; for this purpose, the structures of relationships between variables are tested on the basis of hypothetical causal models and operation of the covariance matrix or correlation.

## 2. Construction of the theoretical model:

Our analysis model is a set of relations that explain the phenomenon studied. In our case we seek to identify and verify the relationship between the creation of business value and intellectual capital or intellectual capital dynamics. That is to say the various relationships between the components of intellectual capital ie human capital, organizational capital and customer capital. Every relationship is supported by a hypothesis that is based on the theoretical framework. These relationships are conditioned by a moderating variable that is the financial capital of the company.

## 2.1. Identification of the analysis variables:

The analysis model is a general goal of our research is to try to identify the relationship between the intellectual capital of the company and its value creation. At this stage, our dependent variable is represented by the variable value creation; the predictor variable is represented by intellectual capital. According to the literature reviewed, we found that this relationship may be influenced by the internal environment of the company (Sullivan 2000) and its financial capital, which is why we added in our model these two moderating variables.

However, the relationship we seek is just more complicated than that. Indeed, intellectual capital is composed of three types of capital ie human capital, organizational capital and customer capital having a dynamic relationship between them; we have to consider also the relationship between these three capitals and their influence on the creation of value. Relationships that will be studied are those of the individual capital with the value creation.

The model is formed by:
- Three explanatory latent variables: human capital, organizational capital and customer capital or relational;
- A latent variable to explain the value creation due to intangible assets;
- A moderating variable: financial capital.

**2.2. The assumptions of work:**

The theme is quite new and not present as such in the Tunisian context, which is why the objective of our work is not to generalize the findings but rather to identify and test the relationships and linkages between variables introduced in the literature. The assumptions of our model are divided into two parts, the first concerning the relationship between the variables in the conceptual model. The second concerns the moderating effects.

**2.2.1 The first set of hypotheses: Relations between variables of the conceptual model:**

A first set of assumptions is verified in our study. It is the relationship between different forms of intellectual capital, and between the latter and the creation of business value.

Hypothesis 1: H1: Human capital, organizational capital and customer capital influence each
-        H1a: The human capital positively affects the structural capital.
-        H1b: The human capital positively affects customer capital.
-        H1c: The customer capital positively affects the structural capital.
The first hypothesis was tested in the four studies that used the MES in the analysis of intellectual capital.

Hypothesis 2: H2: Intellectual capital positively affects the value creation of the company:
-        H2a: The human capital positively affects value creation.
-        H2b: The capital positively affects organizational value creation.
-        H2c: The capital positively affects customer value creation.
This assumption is that one of the contributions of our research will test relations within the value creation.

**2.2.2 Second set of hypotheses: Effect of restraint on the various relationships of the conceptual model:**

We have added to our conceptual model a moderating variable namely financial capital; we believe it has an effect on the various relationships of the model. Hence the second set of assumptions that address this moderating effect.

- Hypothesis 3: H3: Financial capital has a moderating effect on the relationship: intellectual capital-value creation.
-        H3a: The financial capital has a moderating effect on the relationship: human capital - value creation.
-        H3b: The financial capital has a moderating effect on the relationship: organizational capital- value creation.
-        H3c: The financial capital has a moderating effect on the relationship: customer capital -value creation.
The third hypothesis shows the effect of various financing investments in intangible relations model. This is a moderating variable addition of our research compared to previous research.

**2.3. The conceptual model:**

The conceptual model of our research includes:
-        Three exogenous variables: human capital, organizational capital and customer capital;
-        An endogenous variable: value creation;
-        And a moderating variable: financial capital of the company.

We defined two sets of research hypotheses in relation to our conceptual model: a first series on the basic relations of our model and a second series on the effects of moderation.

The synthesis of our model and the research hypotheses are shown schematically in Figure 2.

Figure 2: The synthesis model
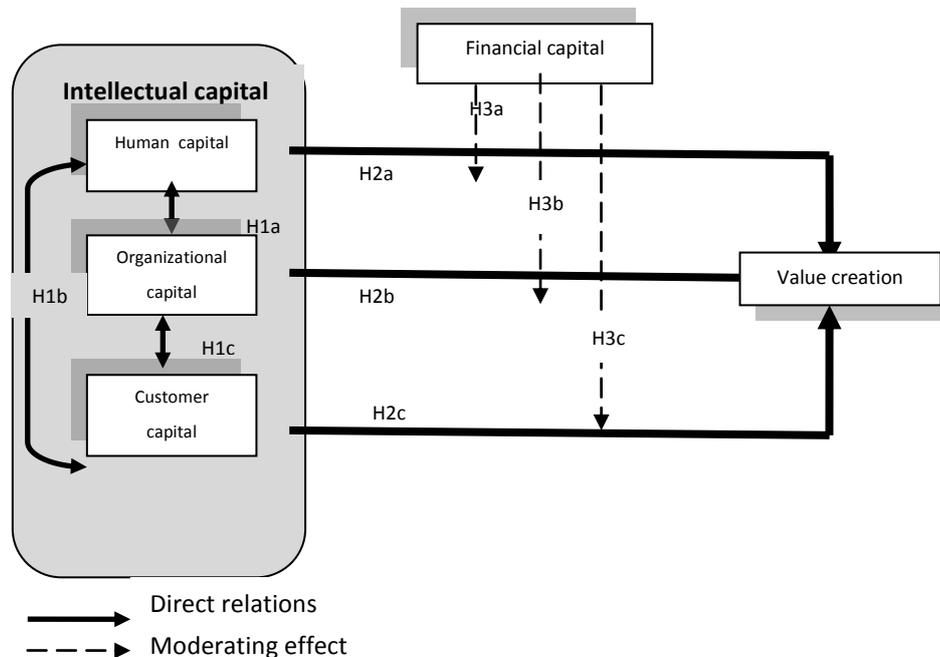


3. **Procedure for construction and validation of restraint in measurement scales analysis:**

To build and validate the measurement scales of variables in our model, we were inspired by the paradigm of Churchill. According to this paradigm, steps 1-4 are the exploratory phase whereas steps 5-8 are the validation phase. We followed the steps in the exploratory phase as recommended by the paradigm of Churchill: Step 1, the specification of the domain constructs, steps 2 and 3 correspond to the generation of a sample of statements and data collection. It is also necessary to choose the rating scale. Step 4, the purification of the measuring instrument is made based on the results given by the principal components factor analysis and calculation of Cronbach's alpha. For the validation phase, we have used confirmatory factor analysis in a limited use of structural equation models.

### 3.1. Variables:

We have at this stage of research one measurement scale for each variable, defined and tested with the questionnaire support: it is the Bontis one (Bontis, 1997; Bontis et al, 2000). Several observations can be made regarding the limitations of these scales: 1 - These scales are tested in Canadian and Malaysian contexts. Both contexts are different from the context of our present research: the Tunisian context. An adaptation of these scales is recommended.

2 - These scales are unidimensional, while the literature shows a multidimensional variables human capital, organizational capital and customer.

3 - The content of the scales of each variable is debatable. Indeed, the level of organizational capital, Bontis eliminates intellectual property. At the level of customer capital, he takes into account only the relations of the company with customers and ignores other external partners of the company.

On the basis of these observations, and relying on the work of Edvinsson and Malone (1997), Sveiby (1997), Roos and Roos (1997), Bontis et al (2000), we believe that changes are needed. A first step in the qualitative analysis led us to define the content of each component variables. Second, we have formulated various measurement indicators.

### 3.1.1. Human capital:

In MERITUM Guidelines (2002), human capital is defined as "knowledge that employees take with them when they leave the company. It includes the knowledge, skills, experience and capacity of persons". Human capital is a dynamic process that is multifaceted and includes various time horizons. It represents the stock of individual knowledge in an organization which is represented by its employees with skills, attitudes and ability or intellectual agility (Roos, Dragonetti, Edvinsson, 1998). Based on the work of Roos et al (1998) and Sveiby (1997), we believe that our three-dimensional variable is composed of three components: "competence", "attitudes" and "intellectual agility" or "capacity." Items of each component are adopted from those of human capital Bontis (1998) with some modifications.

### 3.1.2. Organizational capital:

Organizational capital represents the internal structure of the company, the infrastructure (technologies, methodologies, communication systems ...), processes and culture (Roos et al 1997). The capital of the company is then investments in systems, tools and modes to accelerate the flow of knowledge. It's about investing in new information and communication technologies. It includes both the capital and innovation capital process.

Innovation capital is the renewal capacity, the results of the innovation in the form of licensing, property rights, launch new products and services. R & D can increase the amount of scientific and technical knowledge of cultural, social, and that a firm has introduced new applications of this knowledge. Process Capital represents operating process that improves the efficiency of production of a good or service. This is the practical knowledge in the service of continuous value creation.

### 3.1.3. Customer capital:

Relational capital is all resources linked to the external relationships of the firm (MERITUM Guidelines, 2002). Indeed, the relational capital and customer capital is the relation of the company with external stakeholders such as suppliers, shareholders, external partners, alliances, but also customers. Therefore, we opt for a two-dimensional variable consisting of two components: the "customer relations" and "relationship with stakeholders."
- Relations of partners or network organization (suppliers, administration ......)
- The value of the customer list (+ information on this list)
- Value of customer relationships
- Satisfaction and loyalty with customers
- Value of future profits generated by this loyalty

### 3.1.4. The dependent variable: value creation

Intellectual capital provides the two types of value creation: The first type is the most direct and represents the cash flows. The second type is less direct: some companies use their intellectual capital to position themselves strategically. For example, obtaining customer loyalty (Sullivan 2000).

In the ICM Gathering of 1999, member companies have given a list of values procured through intellectual capital to their firms, and we make the following seven items:
- Improving the reputation of the company on the market
- Improved income products and services
- Reducing business costs
- The means necessary to protect innovation
- Easy access to technology by the company
- The consumer loyalty to the company
- The barriers to entry for potential competitors

### 3.1.5. Moderator: Financial Capital

Based on the interactions inspired from the work of Roos et al (1998), we take the financial capital in the form of funding for the various intangible aspects of the business. In addition to the four forms of intangible investment, qualitative analysis has allowed us to add the financing of investments in working conditions and funding partnerships.

### 3.2. Structural model and measurement model

After determining the theoretical model representing the linear relationships between the variables, using the method of structural equation leads us to define two models: the structural model and the measurement model. The formalization of structural equation equates the general pattern established between all linear relationships between the latent variables suggested by the analysis model. Then we present a system of linear relationships structural or structural model equations and a measuring system of the latent variables or measurement model equations.

**- The structural model:** The structural model of our research is that linear relationships exist between the creation of business value (dependent variable) and the three explanatory variables namely: human capital, organizational capital, customer capital.

**- The measurement model:** The measurement model is a sub part of the full model including the relationships between the manifest and latent variables.

### 4. Methodology and analyses:

First, we discuss the steps of data collection, sample and questionnaire administration. In a second step, we examine the analytical techniques that we apply to data collected from 144 Tunisian companies.

### 4.1. Survey:

Before a collection of empirical data, it is already set our unit of analysis from our target population. It is to contact companies that have some development of their intangible assets. Therefore, we opt for companies that are already enrolled in a program of upgrading from a period significant enough to feel the results of this program. Within the company, we decided to interview officers, because they are most likely to respond to us about the different forms of intellectual capital (human, organizational, customer). Thus, our parent population is composed of Tunisian companies that have joined the program to upgrade, and started their

first program for at least 3 years. This population is scattered over the whole country and from all sectors of activity. It is represented by 2200 companies.

We choose to do the analysis based on a sample of more than 100 companies (considered a minimal but sufficient size for structural equation modeling (Roussel and al, 2002). Our final sample is estimated at 144 companies. Our survey was conducted by questionnaire. The Likert scale of 5 options is recommended in this case to assign scores to each indicator representing a latent variable. To evaluate the wording of the questions, the questionnaire was pre-tested initially with thirty students of Masters in Management who completed without showing any particular difficulties. Then the survey was administered to the leaders of the companies concerned.

### 4.2. Data analysis and results

We discussed the results from different statistical analysis we performed to the data collected. We treat first the principal component analysis (APC) as an exploratory tool data and an instrument of purification of different measurement indicators. Then we treat the confirmatory factor analysis to verify and validate our model. Finally, testing the relationship of the different variables of the overall model is analyzed.

### 4.2.1. Factorial analysis

At first, we performed the validation of measurement scales adopted for the variables in our model. It aims to verify the validity and reliability of the scales used. So we made a first exploratory factor analysis in SPSS 15.0 software, and a confirmatory factor analysis in AMOS 7.0 software. The results of the exploratory analysis are satisfactory. According to the analysis in principal components (APC) and the confirmatory factorial analysis, several factors have been eliminated due to their weak factorial contributions. For the retained factors, they almost all Cronbach's alpha and Joreskog's.rho greater than 0.7 which justifies the discriminant and convergent validities of each retained construct. The results of the validation of measurement scales are in table2.

**Table2**: Results for the validation of measurement scales

| | Number of items Before APC | Number of items after APC | Number of retained factors | Number of items / factor | Total variance explained | Cronbach's alpha | Number of items after AFC | Jöreskog's Rho |
|---|---|---|---|---|---|---|---|---|
| Humain capital | 17 | 8 | 3 | 2 | 76,997% | 0,688 | 2 | 0,854 |
| | | | | 2 | | 0,804 | 2 | 0,869 |
| | | | | 4 | | 0,854 | 4 | 0,891 |
| Organizational capital | 11 | 6 | 1 | 6 | 79,575% | 0,930 | 5 | 0,879 |
| Customer capital | 11 | 9 | 2 | 6 | 75,049% | 0,919 | 5 | 0,916 |
| | | | | 3 | | 0,964 | 2 | 0,905 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Value creation | 7 | 2 | 1 | 2 | 77,342% | 0,706 | 2 | 0,895 |
| Financial capital | 6 | 5 | 1 | 5 | 58,735% | 0,793 | 4 | 0,791 |

We find the three-dimensionality of the human capital variable and the two-dimensionality of the Customer capital variable. Variable organizational capital is one-dimensional. All scales tested measures have very satisfactory psychometric properties.

Second, the analysis of adjustment indexes of the model (Roussel et al, 2002) gave us the following result:

**Table3**: Adjustment indexes of the measure model

| Absolute indexes | | | | | Incremental indexes | | Parsimony indexes | |
|---|---|---|---|---|---|---|---|---|
| $\chi^2$ | RMSEA | RMR | GFI | AGFI | NFI | CFI | $\chi^2$/ddl | AIC |
| 298,729 | 0,076 (< 0,08) | 0,065 (< 0,08) | 0,847 (> 0,8) | 0,765 | 0,900 | 0,951 (> 0,9) | 1,822 (< 3) | 476,729 < 3029,211 (independent model) |

The values of the indicators presented in the table, with the exception of the AGFI (<0.08 but not very far since it is equal to 0.765) are satisfactory and attest to the good adjustment of the model. The model also satisfies the conditions of parsimony as the normalized χ2 is less than 3.

A first reading of the existing adjustment coefficients can give us an idea about the existing relationships in our model. Indeed, the endogenous creation of value is explained by the exogenous variables in our model: human capital, organizational capital and customer capital. But this analysis is not enough to say that our model reproduces correctly the data. This analysis should be completed by checking the significance of the relationship (Roussel et al, 2002).

### 4.2.2. Test of the research hypotheses: the structural model

In a second step, we introduced the test of the overall research model using the structural equation modeling method. This test led us to validate some of our assumptions concerning the basic relationships of the model and the effects of moderation.

### *The validation of the first set of assumptions:*

The analysis for the three exogenous human capital, organizational capital and customers, we gave correlation coefficients and covariance significant at 1% with values of Student's t very significant.

The adjustment coefficients of structural equation model then appear as follows:

**Table4**: The structural coefficients of the research model

| Tested relationship | | | $\lambda_i$ | T Test (CR) | P |
|---|---|---|---|---|---|
| CUST REL | <-- | CUST CAP | 0,495 | 8,543 | *** |
| AGILIT | <-- | CAP HUM | 0,537 | 7,662 | *** |
| COMPT | <-- | HUM CAP | 0,494 | 9,807 | *** |
| ATTITUD | <-- | HUM CAP | 0,469 | 6,098 | *** |
| EXTERNAL PARTNERS | <-- | CUST CAP | 0,486 | 4,571 | *** |
| VAL CREAT | <-- | CUST CAP | 0,340 | 3,418 | *** |
| VAL CREAT | <-- | HUM CAP | 0,273 | 2,422 | 0,015 |
| VAL CREAT | <-- | ORG CAP | 0,441 | 3,210 | 0,001 |

In the first, three hypotheses concerning the dynamics of intellectual capital are validated. The various interactions between the components of intangible assets are tested: human capital / organizational capital, human capital / customer capital and customer capital / human capital. This finding is consistent with those of several authors who have tested these relationships as MR Martinez-Torres (2006), Moon and Kym (2006) and Hsu and Fang (2008), Bontis and al (2000). Indeed, human capital represents those who build structural capital, development capital and organizational capital clientele relies on human capital. In part, more developed is the structural capital of the company, the greater its human capital. Organizational capital is the support or infrastructure that the company provides to its human capital. It promotes the conditions necessary to grow the human capital to create and improve their knowledge.

The hypothesis H2 regarding the effect of various components of intellectual capital on value creation is enabled. Indeed, synergies between different components of intellectual capital are at the origin of the creation of business value. Human capital is the source of value creation of the company; however, without good facilities and infrastructure within the company, this value creation will not happen. In addition, well-established relationships between the company and its market promote the improvement of its value. For Stewart (Stewart, 1999), structural capital is the "packaging" that surrounds the human capital and allows it to be used to create value or wealth for the organization.

### *The validation of the second set of assumptions:*

The test of the differences between the $\chi^2$ of the free model and the constrained model is significant with the use of a multi-group analysis. This analysis involves dividing the data file into two different files.

For the three relationships between the value creation of the company and the three components of intellectual capital, the moderating effect of the financial capital is significant.

**Table 5:** Value of student T: result of the mediating effect

| Tested relationship | | | Critical Ratio Student T |
|---|---|---|---|
| Customer capital | ------> | Value creation | -2,411 |
| Humain capital | ------> | Value creation | -2,527 |
| Organizational capital | ------> | Value creation | 3,196 |

All values of CR (or Student T) are greater than 1.96, so the effect of the moderating variable is significant at the three relationships. For the variable "financial capital", the H3 hypothesis is validated and its three assumptions. Indeed, funding various forms of intangible assets at the company only improve the effect of different components of intellectual capital value creation. The more we invest in training, the more human capital grows.


**Conclusion:**

Our theoretical model was developed based on the analysis of the literature. It is to integrate different concepts and their interactions. This allows better understanding and deepening existing relationships in different literature. Indeed, our theoretical model is an integrative and explanatory nature of the dynamics of intellectual capital and its impact on value creation. The majority of studies have examined the concept of intangible capital statistically while our model shows the different interactions and synergies existing between the components of intellectual capital. It was built in the theoretical model of moderating variables that may influence the relationship between intellectual capital and value creation of the company

Our work is part of a managerial logic using a quantitative approach. To do this, we used the technique of self-administered survey questionnaire. It contains different scales defined in the literature and can be used in a full or partial manner. To implement our investigation we have proposed a set of scales for different variables in our model. These scales were developed on the basis of the literature and given the lack of data on these measuring instruments; we created our own scales we tested for the first time. We ended up with scales valid and reliable measurement.

We tested our scales on a sample of Tunisian companies. We emphasize at this point that this is the first time such type of research has been done in the Tunisian context (All studies are conducted mostly in Canada, Scandinavia and Asia). Our work consists in the presentation of multidimensional scales of certain variables in the model. Indeed, the three-dimensionality of human capital has been verified in the analysis and the two-dimensionality of the variable capital clients. These scales are built satisfactory statistical indicators. We used the method of structural equation modeling to test and validate our concept and the variables that constitute the model. Indeed, this technique is rarely used in managerial studies; rather it is an essential tool in marketing and HRM studies. In addition, the integration of this method in studies of the concept of intangible capital is recent and it is rarely used. The use of this method allowed us to manipulate not directly observable latent variables to validate our scales, estimate our global model, and also determine the meaning of the different existing relationships between variables in the model and justify the moderating effect of "finance capital "in our model.

However, this research is exploratory, and the results need to be confirmed by further work. The scales we used, although they have very satisfactory psychometric properties were tested for the first time. They should therefore be retested on larger samples to verify their robustness and stability. Therefore, the sampling should be replicated in order to increase the external validity of our results.

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