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The Impact of Intellectual Assets Management on Profitability in Egyptian Companies: A Proposed Model

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Abstract
The purpose of this study is to develop a model for managing intellectual assets for the purpose of improving profitability in Egyptian companies. This model is tested in Egyptian ICT companies and measure the perceptions of managers to the proposed model. A self-administrated questionnaire delivered and collected by hand is used to collect the data to examine the hypothesized relationships. Relationships of model is examined using ordinal regression technique.The quantitative analysis indicates that there is significant relationship between different proposed phases of intellectual capital management and profitability. The quantitative analysis using ordinal regression also shows one of the most important results which is, the integration between the three proposed phases and related indicators are associated with profitability. Moreover, it suggests that the best model is that containing all three phases as it predicted a higher level of profitability and its variables are most strongly associated with the profitability. This study is conducted only in a single country and in a single sector that of the Egyptian ICT sector. The proposed model can be used as a vital tool by managers in ICT companies to manage intellectual assets effectively. Such a model can be used to improve profitability by focusing on intellectual assets driver. It is the first study of its kind, this model provides a contribution to the theoretical literature in the field. It also practical contribute in managing Intellectual assets of the Egyptian ICT sector.

Keywords: *Intellectual assets, profitability, Egyptian ICT sector, analysis and evaluation of current status of intellectual assets; identification of value adding intellectual activities; and, evaluating results.*

Introduction

In a knowledge – intensive economy, Intellectual assets represent the main element which result in a company's success or failure in achieving its multiple objectives (Mouritsen, 1998). This is further supported by Daley (2001), who studied more than 300 Canadian and 500 American companies and concluded that the managers of these companies believe that intangible assets, such as knowledge and experience, are the main factors of success for these companies. Therefore, intellectual assets have now become the main driver of a company's success or failure. These are affirmed by Kaplan and Norton (2004), who state that intellectual assets are the main tools applied to

create value for shareholders, customers and society as they constitute more than 75 % of the value of the company. This emphasises that intellectual capital become a key strategic value in the knowledge economy (Tayles, Bramley, Adshead, and Farr, 2002).

The different elements of intellectual assets are related to each other and to financial performance which leads to create more value for companies and enhance financial performance Ben Tanfous,(2013) and Mhedhbi,(2013).

Intellectual assets is the main resources and contributions to company financial performance. This is position is propounded by Marr, Gray, and Neely (2003), who state that it is important to understand the relationship between these assets and profitability.

The impact of intellectual assets on profitability is being investigated over the last decade by the studies of (Chen, Cheng and Hwang (2005), by Belkaoui, (2003); Tan, Plowman, and Hancock, (2007); Makki and Lodhi, (2008); and Muhammad and Ismail, (2009). They all found that there is a positive relationship between intellectual capital and profitability. This suggests that intellectual capital is a key driver in managing profitability. This emphasizes that intellectual assets plays a critical role for extraordinary profitability. Over the last two decades Intellectual assets measurement and reporting has become the main focus of academicians and practitioners. However, there is a lack of literature that have focused on managing intellectual assets and developing strategic models especially in Egyptian companies.

The main purpose of this study is to develop a model for managing intellectual assets for the purpose of improving profitability in Egyptian companies.The paper adds to the literature of intellectual assets in three crucial aspects. First, it explore three phases to managing intellectual assets effectively. Financial and nonfinancial indicators were then identified for each phases to establish a proposed model of intellectual assets to maximize profitability in Egyptian ICT companies. Second, the research examine the perceptions of managers to three phases with their indicators and their importance in maximizing profitability. Finally, it is the first study of it is type undertaken in Egypt as one of the developing country. Thus, the creation of the model and the findings offer both theoretical and practical contributions to management accounting field.

Prior literature and develop the intellectual assets model

Prior literature

A number of empirical studies examined the role of intellectual assets in the financial performance. For example, Chen, Cheng and Hwang (2005), studied the contribution of intellectual assets in the financial performance of companies and the possibility of using them as indicators of financial performance in the future. The study investigated 30 Taiwanese companies. The hypotheses of the study are based on studying the relationship between intellectual assets and the financial

performance of companies. Financial performance is expressed in terms of return on ownership, ratio of return on assets, growth in net sales, and net value added per employee. The results were all positive in relation to all four models of financial performance. This means that the companies that have higher intellectual assets achieve better results in terms of profitability and revenue growth. The study concluded that intellectual assets play a critical and fundamental role in improving profitability and revenues increase. The relationship between intellectual capital and financial performance is also investigated by Belkaoui, (2003); Tan, Plowman, and Hancock, (2007); Makki and Lodhi, (2008); Muhammad and Ismail, (2009); and Ben Brahim and Ben Arab (2011). They all found that there is a positive relationship between intellectual capital and profitability.

Few studies have focused on managing intellectual capital in general. For example studies by Larsen, Bukh, and Mouritsen (1999); Canibano et al. (2002); Fabritius (2003); and Mouritsen, Bukh, and Marr (2004) which focus on the value creation approach in managing intellectual assets. This is done through identifying and defining the main intellectual resources that cause value creation, analysis the current status of them, determining value added intellectual capital activities, and evaluating whether such activities achieve companies goals or not.

A group of studies have focused on developing financial and nonfinancial indicators that can be used to managing intellectual assets (Kaplan and Norton, 1996, Canibano, Ayuso, Sanchez, Olea, and Escobar, 1999; Liebowitz and Suen, 2000; Phillips and Phillips, 2002; Canibano et al., 2002; De Pablos, 2003; Fabritius, 2003; Metwalli, 2003; Chen, Zhu, and Xie, 2004; Bose, 2004; Mouritsen, Bukh, and Marr, 2004; Abdel-Maksoud, Dugdale, and Luther, 2005; Al-Kheyal, 2005; Al-Gendy, 2005; and Essia, 2007).

The majority of intellectual assets studies are focused on American and European companies. However, limited studies have focused on the measurement and reporting of intellectual assets in Egyptian companies (Seleim, Ashour, and Bontis, 2004; and Seleim, Ashour, Bontis, 2006, Ismail, 2008, Ahmed and Hussainey, 2010, Seleim and Khalil , 2011). The main focus of (Seleim, Ashour, and Bontis, 2004) study was to build a measurement system which consists of the key intellectual capital indicators in Egyptian software companies. The other study of Seleim, Ashour, and Bontis, (2006), examined the relationship between human capital and organizational performance within software companies in Egypt. Moreover, a national intellectual capital model has been developed by (Bontis, 2004). This study investigated the interrelationships among the elements of the intellectual capital and the relationship between such elements and the financial results in ten Arabic countries (Egypt was one of them).

Voluntary intellectual capital reporting (ICR) in Egyptian companies' annual reports was examined by Ismail (2008). Moreover, this study discovered ICR practice and the barriers that impact the development and implementation of IC indicators in Egyptian companies. Another study is that of Ahmed and Hussainey (2010) also examined managers' and auditors' perceptions of intellectual capital (IC) measurement and reporting in Egyptian companies.

Seleim and Khalil (2011), empirically investigated the two way relationship between knowledge management processes and intellectual in Egyptian software industry.

It can be seen from the above discussion of the prior studies that no previous research in this subject area has combined three phases for managing intellectual assets using value creation approach and developing financial and non-financial indicators that relevant to manage such value creation phases. In addition, no previous research has examined the relationship between the three proposed phases and their related indicators on one hand and profitability on the other hand.

In addition, No previous research in this subject area has conducted in Egyptian ICT sector, hence this exploratory research adds new knowledge in the field, both through the theoretical development and industry testing of the model.

The lack of management accounting literature that concerns a comprehensive strategic view in managing intellectual assets in Egyptian context, including the three key phases for value creation and managing them using financial and non- financial indicators supports the need for this study.

Developing the Intellectual assets model and hypotheses

The proposed assets model is adapted from studies by Larsen, Bukh, and Mouritsen (1999); Canibano et al. (2002); Fabritius (2003); and Mouritsen, Bukh, and Marr (2004); which focus on the value creation approach. According to Boedker, Guthrie, and Cuganesan, (2005), the value creation approach is based on defining and identifying the intellectual resources that cause value creation. This involves more than just determining a financial value for the resources. This approach is based on the assumption that the future financial performance can be predicted by non-financial performance. This approach is concerned with how to create and develop value through identifying value creation sources and studying how they can affect the company's current and future performance. According to Kaplan and Norton (2000; 2004a; and 2004b) the improvement in intellectual capital affected profitability through a chain of cause and effect relationships. This means that the use of value creation approach, which focuses on using non-financial performance in improving financial performance, leads to improved profitability. Therefore, the proposed assets model relies on a value creation approach in building and determining the measurement level of intellectual capital. Consequently, the main purpose of the proposed model is not to determine the financial value of intellectual assets or its different elements, but rather to help in realising the ultimate goal, i.e. achieving profitability. This is done through identifying and defining the main intellectual resources that cause value creation, analysis the current status of them, determining value added intellectual capital activities, and evaluating whether such activities achieve companies goals or not.

This can be measured using both financial and non-financial indicators that are expected to affect profitability (Low, 2000; Bollen, Vergauwen, and Schnieders, 2005). Such indicators are adapted from (Kaplan and Norton, 1996, Canibano, Ayuso, Sanchez, Olea, and Escobar, 1999; Liebowitz and Suen, 2000; Phillips and Phillips, 2002; Canibano et al., 2002; De Pablos, 2003;

Fabritius, 2003; Metwalli, 2003; Chen, Zhu, and Xie, 2004; Bose, 2004; Mouritsen, Bukh, and Marr, 2004; Abdel-Maksoud, Dugdale, and Luther, 2005; Al-Kheyal, 2005; Al-Gendy, 2005; and Essia, 2007). Therefore, it could be suggested that intellectual capital can be managed using three key Phases, namely: analysis and evaluation of current status of intellectual assets; identification of value adding intellectual activities; and, evaluating results.

The first phase: Analysis and evaluation of current status of intellectual assets

This aspect is divided into two main stages. Firstly, identifying and evaluating main drivers. This is represented by the important factors associated with, and directly participating in, the process of value creation and achieving strategic goals. It is necessary to identify the main drivers for each of the main resources. Examples of these drivers are: developing the company's processes, building customer participation, high level training. It can be suggested that it is possible to collect data at this stage through conducting interviews and seminars with heads of departments, directors, and higher management, with the purpose of identifying these drivers at the level of each of the main resources. This stage also focuses on studying how these drivers are reflected in the company's vision and value. It is important to make sure that such drivers participate in the realization of the company's vision and the value creation. At this stage, two questionnaires for collecting information are suggested. The first questionnaire studies the likely effects of the proposed drivers on the company's vision. This questionnaire is designed for higher management. The second questionnaire seeks to examine the likely effects of the proposed drivers on the use value. This questionnaire is prepared for current or potential customers.

Secondly, analysing and designing current resources. This stage aims at determining the availability of the correct configuration of resources that directly participate in the realisation of strategic goals and achieving the effective management of the main drivers of the above-mentioned resources.

To conclude, this stage is concerned with determining the sufficiency and appropriateness of the current goals for value creation, and, in the case of their insufficiency, whether there is a need for developing more ambitious goals. It is also concerned with whether the current actions and practices are sufficient and appropriate to reach the strategic goals and create value, or need development, or need the introduction or merge of other actions for this purpose. It can be argued that in order to thoroughly analyse and evaluate the current position, it is necessary to set up a set of indicators that help the process of analysis and evaluation at the level of each main resource. Among the indicators proposed to be used at this stage are illustrated in **Table 1** (by way of example and without limitation).

Table 1 Proposed Indicators for Analysis and Evaluation of Current Status of Intellectual Assets

Total number of employees; Service period; Distribution of employees; Average age; Official education and training; Staff-turnover; New recruitment; recruitment costs; Distribution by type; Average number of permanent employees; Distribution of employees over different tasks; Percentage of employees holding master's and doctor's degrees; Percentage of key employees; Number of directors; Number of part-time employees. Distribution of employees over processes; Total operating time; Current year's production volume; Current year's production costs; Repair and re-operation costs; Number of orders of supply; Process stopping time; Investments in research and development; Process time; Number of days off; Number of projects carried out with external participation (explanation of project type, tasks, and sold items).	Marketing costs; Names of important customers; Percentage of new customers in relation to total customer number; Annual sales for each customer; Average size of a customer's order; Current customer turnover; Percentage each customer represents as a part of company operations; Number of new products; Number of competitors' new products; Distribution of revenues over markets and products; Rate of product and customer distribution over markets; Volume of defective production; Normal delivery time; Customers with highest rate of turnover; Change in customer numbers. The company's IT capacity (total investments in IT); Number of computers per employee; Number of internal IT customers; Number of external IT customers; Number of services provided through the Internet; Amount of information and data on the company's site on the Internet; Number of IT centres or departments; The ratio of programmers to the number of employees; Database updating rate.

The second phase: Identification of value adding intellectual activities

This stage is concerned with the identification of the activities necessary for creating value, which are represented in the company's actions and practices for significantly developing, improving, and increasing its intellectual resources. Examples include developing specific marketing activities for achieving customer loyalty, customer service training activities, forming research and development or software programmers' committees, organizing training programmes in the company's processes, investments in processes, and education activities, etc. Activities may differ from one company to another, or, in the same company, from time to time, even if the performance main drivers are the same.

In order to identify the targeted activities the following alternatives must be studied: introducing new intangible activities, developing current activities, eliminating some or merging some activities with a view to achieving strategic goals. In this respect, it is necessary to observe the relative importance of each activity. Focusing on some of the activities is more important than others since they play a more important role in giving a relative advantage to the company. In order to choose from among the alternatives, the effect of each alternative on the value creation should be studied, in addition, using a number of indicators proposed at this stage for each of the resources. These indicators illustrate in **Table 2.**

Table 2 Proposed Indicators for Identifying Value Adding Activities

Number of customers per employee; Ratio of marketing costs to income or revenue; Ratio of administrative costs to marketing costs; Number of orders delivered in time; Post-sale services; Marketing costs per customer; Ratio of marketing costs to total costs; Information costs for each customer; Number of days allocated for exhibitions, customer meetings and training; Number of pamphlets printed for customers to introduce product to them; Costs of support per customer per annum; Costs of service per customer per annum Ratio of research and development costs to management costs; Investments in research and development; Quality improvement costs; Throughput rate; Total throughput time; Defective production costs; Total of supply orders delivered by each supplier; Product development time (the time from the product as an idea till the completion of its development); Customer response time (the time from customer's order till delivery); Breakdown time; Process development time; Percentage of time used in development; Total quality application and improvement costs.	Training and teaching costs per employee; Number of training days per employee; Employees' participation in setting plans; Number of employees participating in each task; Annual costs of internal and external courses; Costs of new ideas generated by employees; Number of training or teaching hours. Costs of new capital investment; Costs for software and computer machines purchase and maintenance; Research and development costs; Continuous development of the company's site on the Internet; The ratio of IT to management costs.

The third Phase: Evaluating results

The general goal for the evaluation stage is to judge the company's effectiveness in intellectual asset management. This is realised through evaluating whether the activities and actions proposed have

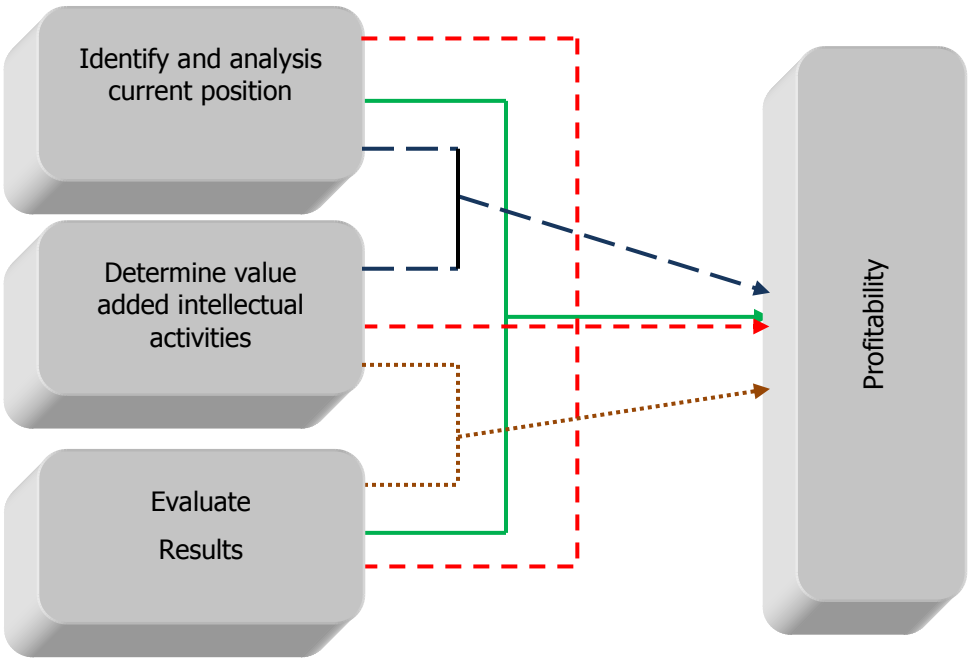
been applied, as well as evaluating the effects of its application and reflection for each resource. In this respect, a proposed set of indicators can be used in evaluating the results for each of the intellectual resources, as shown in **Table 3**.

Table 3 Proposed Indicators for Evaluating Results

Customer satisfaction; Customer loyalty; Rate of long-term customers; Quality rate; Competitive superiority rate; Post-sale service development rate; Decrease in percentage of returned goods; Current customer turnover rate; Ratio of lost customer to total customers; Ratio of new products to total sold goods; Rate of new customers. Error rate; Waiting time; Development rate in throughput time; Development rate in product development time; Ratio of defective production to total production; Quality cost rate; Cost of production unit; Number of quality standard certificates; Efficiency of operating cycle; Complaint index rate.	Employee satisfaction; Incentive index; Sick leave; Added value per employee; Employee loyalty; Employees turnover rate; Employee daily performance rate; Profit ratio to the number of employees; Savings resulting from applying employees' suggestions; Ratio of employees leaving work to total number of employees. Obtaining IT licences; Technological development rate; Competences in IT; Development rate in knowledge and IT; IT performance development per employee.

Figure 1 describes the conceptual Intellectual assets model. The independent variables consist of analysing and evaluating the current position, identifying value-adding intellectual activities, and evaluating results; and the dependent variable is described by profitability.

Figure 1. The Proposed intellectual Assets Model



The proposed assets model reflects how the integration between the three proposed steps affects profitability to determine which of the various combinations of the measurement level variables provides best explanation of profitability. In essence, it is assumed that the integration between the three steps better predicts the level of profitability than the use of any combination between any two variables. Therefore, it is anticipated that the more the proposed assets model containing the three steps is used, the more profitability is achieved. Thus hypotheses related to the assets model can be formulated as follows:
H1: Analysing and evaluating the current position and identifying value-adding intellectual activities steps are related to profitability.

H2: Analysing and evaluating the current position and evaluating results steps are related to profitability.

H3: Identifying value-adding intellectual activities and evaluating results steps are related to profitability.

H4: Analysing and evaluating the current position, identifying value-adding intellectual activities, and evaluating results steps are more related to profitability than any of the relationships identified above.

The Egyptian ICT sector context

Information and communications technologies increase companies' productivity, thereby fueling the growth of the global economy and helping companies be more competitive. Moreover, ICTs expand the reach and effectiveness of social development projects which achieve great benefits in different areas such as healthcare, education, and environmental preservation. Although developing countries have faced various challenges, ICTs hold tremendous potential to help overcome these challenges and create new opportunities in developing countries (Anonymous, 2004).

Following the huge global developments in communication and information technology (ICT) in the early part of the 21st century, Egypt as one of the developing countries has also witnessed development in this field. The EMICT (2009), cited that a leading research and information analysis company called RNCOS, stated in its report that the ICT industry in Egypt has emerged as a rapidly growing sector (The development of spending on the Egyptian ICT sector; The development of investments in the Egyptian ICT sector; The development of revenue in the Egyptian ICT sector; The development of the number of ICT companies; and The development in the number of ICT's employees). This report also positions Egypt in the second place in terms of IT industry development amongst all Middle East countries. This is further confirmed in the report published by (BMI, 2007). This was affirmed in Egyptian MICT report in 2007, which cited that UK IT week magazine report stated that Egypt was trying to become the India of the Middle East in terms of ICT, as it sought to increase its share of the global outsourcing market. This position would show Egypt as a new growth market, and lead to creating new and profitable opportunities.

In addition, ICT companies are an excellent setting to understand the features of a knowledge-based economy as they are characterized by extensive dependence on intellectual capital and they lack tangible assets and face a rapid obsolescence of products more so than the firms in other sectors. Consequently, managers in such sector need the proposed model for managing intellectual capital for the purpose of improving profitability of ICT companies. In order to reduce variables in the sample, the model was tested in the Egyptian ICT sector, so country and sector variations were not variables that could impact on the results.

Data and research methods

The method used for data collection was a questionnaire. A self-administrated questionnaire, delivered and collected by hand, was utilised to test the proposed model. As a theoretical model of intellectual assets was created by reviewing and adopted from the literature, This model was then used to develop the questionnaire in order to test the proposed model The objective of

this questionnaire was to collect data about the perception of managers related to each variable in the model and their relationships, which can then be used in evaluating the developed model.

Care was taken to ensure that questions covered all theoretical constructs contained in the proposed model. In addition, a 5-point Likert-type scale (from (1) not important to (5) very important for some questions and from (1) completely disagree to (5) completely agree in others) was used in most questions. In this research closed question format was deemed the most appropriate type for the length of questionnaire adopted. In addition, due to the pressure of respondents' time and a cultural dislike of such open questions, as they require a detailed answer, closed questions were deemed to be most appropriate.

The questionnaire was pre-tested and evaluated by six reviewers, two academics familiar with the Egyptian ICT industry, one academic statistician specializing in accounting research and three practitioners. Reviewers were asked to test the questionnaire and identify unclear items and suggest changes. Changes were made, based on the comments and suggestions received from the reviewers.

Due to time and resource restrictions, a judgment sample is used in the current study. The current study focuses only on the ICT members of the Chamber of Information Technology and Communication. The determination of such a sample is justified as follows: firstly, all the members are registered in the Federation of Egyptian Industries and have annual financial reports, in addition to which, they have financial departments and hence have specialists in the accounting field who are more likely to be interested in the current study. Secondly, the Chamber of Information Technology and Communication has a database, which includes detailed information about company profile, profit and loss accounts, ratios and trends, and all site and trading addresses contact details. All of this information makes it easy to contact possible respondent companies, which represents a difficult task in Egypt as a developing country. The sample in the current study is drawn from the Federation of Egyptian Industries' database.

Four variables of the assets model measured by different items in the questionnaire as illustrated in **Table 4**. As there are a huge number of indicators suggested in the literature and these are adapted for use with theoretical assets model, and the questionnaire focuses on the most commonly used indicators in most literature.

Table 4. Variables and Questionnaire Items of Assets*

Independent variable	Analyzing and evaluating current position of intellectual capital	Twenty six items
Independent variable	Determining value added activities	Twenty one items
Independent variable	Evaluate the results	Twenty two items
Dependent variable	Overall profitability	Three items

* the order of variable presentation in the table is a reflection of the order of item presentation in the questionnaire

467 questionnaires were distributed by hand. After one week, companies which had not replied within the first week were phoned to remind them. After three weeks a reminder letter with another copy of the questionnaire was delivered by hand to companies which had not replied. 277 companies apologized for not completing the questionnaire. Of the completed questionnaires, 80 were completed and collected after the first delivery. 50 were collected after the first follow up process. A further 60 were collected after the second follow up process. A total of 190 completed questionnaires were received.

Data analysis approach

Factor analysis and reliability of the proposed phases

Structural factor analysis is applied at each stage and related proposed indicators (current position of intellectual assets, value adding intellectual assets activities, evaluating the effectiveness in managing intellectual assets). Common Factor Analysis is used. Due to the non-normality of asset items, Principal Axis Factoring as an extraction method is used.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, indicated that the sixty nine sampling items (indicators) are adequate for structural factor analysis, with a KMO measure = .91 which can be described as "meritorious" (Hair et al., 1998). In addition, the significant level for Bartlett's test is 0.00 (less than .05). Such results indicate that this data is appropriate for factor analysis (with Principal Axis Factoring and Varimax rotation.

All ***sixty nine*** items included in the analysis have communality values ranging from .4 to .8, which again are common in social science (Velicer and Fava, 1998). In addition, all ***sixty nine*** items have

a factor loading above .62 which is "very significant" and indicates a strong correlation between items and the factor they belong to. Furthermore, all items are loaded highly on only one factor and are not split loaded on another factor above .32 (Tabachnick and Fidell, 2001). Principal Axis Factoring with Varimax suggests that three factors with eigenvalues of 1.0 or above are extracted and ***sixty nine*** items are retained under the three factors explaining 64% of the variance in the data set. The first factor explains f34% of the variance, the second for 14%, and the third for 16%. None of the remaining factors are significant.
The factors are labelled according to the commonality of items loading on each factor as follows: **Analyzing and evaluating current position of intellectual capital; determining value added activities; and evaluate the results**.

Cronbach's alpha is calculated to test reliability and internal consistency for each factor. The result indicates that the Alpha coefficient for all factors is above 87% which is higher than the standard estimates of .70 (Howitt and Cramer, 2008).

Table 5 The Results of Factor Analysis

Factors	Loading	Eigen Value	Variance Explained	Reliability Analysis
Factor 1		9.4	34%	.94
- Total number of employees.	.74			
- Average number of permanent employees.	.81			
- Number of part-time employees.	.83			
-Number of directors.	.79			
- Service period.	.87			
- Average age.	.66			
- New recruitment.	.90			
- Staff-turnover.	.85			
- Recruitment costs.	.83			
- Annual sales for each customer.				
- Change of customers.	.80			
- Average size of customer's order.	.63			
- Marketing costs.	.82			
- Estimated delivery time.				
- Volume of defective production.	.71			
- Total investment in IT.	.87			
- Number of IT departments.	.67			
- Number of computers.				
- Number of services provided through the Internet.	.82			
- Amount of information and data on the company's site on the Internet.	.89			
- Total production time.	.78			
- Current year's production	.92			
	.66			
	.71			

volume.	.78			
- Current year's production costs.	.70			
- Number of orders of supply.	.63			
- Processes stopping time.	.70			
- Repair and re-operation costs.	.66			
Factor 2				
- Training and teaching expenses per employee.	77	3.8	14%	.88
- Number of training days per employee	.92			
- Number of training hours.	.84			
- Costs of new idea generated by employees.	.64			
- Ratio of marketing costs to total costs.	.66			
- Ratio of marketing costs to total income.	.75			
- Marketing costs for each customer.	.63			
- Number of orders delivered in-time.	.98			
- Product development time	.77			
- Customer response time	.74			
- Breakdown time.	.87			
-Defective production costs.	.84			
-Quality improvement costs.	.89			
- Investment in research and development.	.66			
- Percentage of time used in development.	.89			
- Costs of new capital investment.	.85			
- Costs for software and computer purchase and maintenance.	.96			
- The ratio of IT costs to administration costs.	.90			
	.92			
Factor 3				
- Customer satisfaction.				
- Customer loyalty.	77			
- Number of long-term customers.	.83			
- Post-sales service development rate.	.86	3.8	16%	.90
- Decrease in percentage of returned goods.	.79			
- Current customer turnover rate.	.81			
- Number of new customers.	.82			
- Error rate.	.79			
- Ratio of defective production to	.63			

total production - Cost of production unit. - Development rate in throughput time. - Development rate in product development time. - Waiting time. - Employees turnover rate. - Development rate in employee's daily performance. - Ratio of employees leaving work to total number of employees. - Employees' loyalty. - Technological development rate. - IT performance development per employee. - Obtaining IT licenses. - Development rate in knowledge of IT.	.89 .79 .91 .83 .77 .79 .60 .93 .91 .81 .76 .86 .84			
Total variance explained	64%			

Table 5 shows the factor analysis findings of intellectual assets indicators for three phases. This findings show that the proposed indicators (sixty nine) are retained under the three phases which are Analyzing and evaluating current position of intellectual capital; determining value added activities; and evaluate the results. For phases one twenty six financial and none financial indicators can be used to measure and mange such phase. For phase two eighteen indicators loading on it which emphasizes that such indicators can effectively use to manage phase two. In addition, twenty one indicators are loading on phase three which emphasizes that such indicators can be used to manage this phase.

It can be concluded that the proposed indicators for each phase are significant correlated and loading on each phase. Consequently, Egyptian ICT managers can use such phases and related indicators in managing intellectual assets.

Hypothesis tests related to the assets model

As the main purpose of this aspect is to investigate if the combination of the three variables "analysing and evaluating the current position of intellectual assets (CIC)", "determining value-adding intellectual assets (VIC)", and "evaluating the effectiveness of managing intellectual assets(MIC)", is the best model that predicts and improves profitability. Ordinal regression is run for the various combinations of the three variables (CIC and VIC, CIC and MIC, MIC and VIC, CIC, MIC and VIC) to find the best

combination of variables, which meets the proportional odds assumption, fits the data well, significantly predicts profitability and produces the highest pseudo R square statistics.

Table 6. Test of Parallel Lines

Combination of Variables	Chi Square	d.f	Sig.
CIC and VIC	1.19	2	.55
CIC and MIC	.4	2	.82
MIC and VIC	1.85	2	.34
CIC, VIC and MIC	2.73	3	.44

The test of parallel lines showed that this assumption is not violated for all models, indicating that the relative effect of predictor variables is consistent across all levels of profitability. Such a result means that ordinal regression can be run for these models **(see table 6).**

Table 7. Model Fitting Information

Combination of Variables	Link Function	Chi Square	d.f	Sig.
CIC and VIC	Negative log-log	224.2	2	.00
CIC and MIC	Logit	53.7	2	.00
MIC and VIC	Logit	204.5	2	.00
CIC, VIC, and MIC	Negative log-log	248.0	3	.00

It can be seen from the above table that all models are fit well to the data, showing the predictors added significant value to models **(see table 7).**

Table 8. Goodness of Fit

Combination of Variables		Chi Square	d.f	Sig.
CIC and VIC	Pearson Deviance	220.0 173.0	374 374	1.0 1.0
CIC and MIC	Pearson Deviance	379.0 246.0	374 374	.41 .84
MIC and VIC	Pearson Deviance	326.7 197.1	376 376	1.0 1.0
CIC, VIC, and MIC	Pearson Deviance	239.0 152.0	375 375	1.0 1.0

The above table shows that for all combinations of the data fit the models, in that the expected and observed value did not significantly differ as evidenced by Pearson chi-square and by deviance chi-square statistics **(see table 8)**.

Table 9. Pseudo R-Squares

Combination of Variables	R-squares Measures	Values
CIC and VIC	Cox and Snell Nagelkerke Mc fadden	.69 .79 .56
CIC and MIC	Cox and Snell Nagelkerke Mc fadden	.25 .28 .13
MIC and VIC	Cox and Snell Nagelkerke Mc fadden	.66 .75 .59
CIC, VIC, and MIC	Cox and Snell Nagelkerke Mc fadden	.73 .83 .62

The analysis of the R-square measures for all models indicates that there are higher correlations between predictors and profitability for the CIC and VIC, MIC and VIC and IC, VIC, and MIC models compared with the CIC and MIC model. In addition, the CIC, VIC, and MIC model is the best because its predictors are most strongly associated with the profitability. It can be concluded that profitability is better predicted by the model containing "analysis and evaluating the current position of intellectual assets (CIC)", "determining value adding intellectual assets (VIC)", and "evaluating the effectiveness of managing intellectual assets (MIC)" together **(see table 9)**.

Table 10. Parameter Estimates

Variables	Estimate	Wald	d.f	Sig.
CIC	2.0	30.0	1	.00
VIC	7.3	73.0	1	.00
CIC	1.12	11.3	1	.001
MIC	2.3	36.7	1	.00
MIC	2.18	18.4	1	.00
VIC	8.75	69.8	1	.00
CIC	2.2	31.2	1	.00
VIC	7.9	63.0	1	.00
MIC	1.6	20.0	1	.00

Table 10 shows that all predictors in the four models are significant in predicting profitability. In addition, all regression coefficients in all models have positive values, which means that for a one unit increase in each predictor variable, the profitability level is expected to change to a higher level by its respective regression coefficient, while other variables in the model are held constant.

The findings indicate (see table 9 and 10) that the model that contains "analysing and evaluating the current position of intellectual capital" and "determining value adding intellectual capital" provides the second highest level of association with profitability. Therefore, the hypothesis **(H1)** that integration between these variables is related to profitability can be accepted. This means that companies that aim at effectively managing assets should mainly focus on these two phases.

The findings of this study reveal (see table 9 and 10) that the third model to achieve a high correlation between its variables and profitability is that of "identifying value added intellectual activities" and "evaluating the effectiveness of managing intellectual capital". Therefore, the hypothesis (**H2**) that integration between these variables is related to profitability can be accepted.

Although, the findings of the current study also suggest that the model containing "evaluating effectiveness of managing intellectual capital" and "analysing and evaluating the current position" predicts profitability, it provides a lower association with profitability compared with other combinations. Therefore, the hypothesis **(H3)** that integration between these two variables is related to profitability can be also accepted.

Tables 9 and 10 show one interesting finding from this study, which has not been highlighted in other research, is that each phase in the comprehensive model as well as the proposed comprehensive assets model that contains the three suggested phases and related indicators, associated with profitability and are significant in predicting profitability. Although all combinations predict a higher level of profitability, the best model is the model that contains the three phases together, as its predictors are most strongly associated with profitability. Therefore, the hypothesis **(H4)** that integration between the three phases is more related to profitability than any of the relationships can be accepted. This result emphasizes that the integration between the three variables should achieve better profitability than the alternative models that contain only a combination of any two variables. This means that companies that strategically mange intellectual assets should manage the three phases of analysing and evaluating the current status of intellectual resources and activities, identifying proposed intellectual activities and evaluating results in a coherent model in order to improve their profitability. Furthermore, managers of ICT sector should adopt the proposed financial and non- financial indicators for each phase to manage intellectual capital assets effectively for the purpose of improve profitability.

There is consistency between the finding of the assets model related to the positive influence of the proposed intellectual indicators on profitability and the previous studies that empirically investigated the relationship between the use of intellectual capital indicators and profitability (Low, 2000; Chen et al., 2004; and Bollen et al., 2005). However, these previous studies used different intellectual capital components such as human capital, structural capital, innovation capital, and customer capital and used different indicators which have not been used by the current model. In addition, they examined the relationship between these components and profitability using different statistical methods such as multiple regression analysis and the path analysis. Moreover, they were conducted in different sectors and different countries from the current study.

Conclusion

The principal purpose of this study is to develop a strategic model for managing intellectual assets for the purpose of improving profitability. This model was developed and adopted from the previous literature. Three phases and related indicators were proposed to manage intellectual capital from the value creation perspectives. These phases were analyzing and evaluating the current status of intellectual resources and activities, identifying value added intellectual activities and evaluating results. Relationships between all combinations of the three phases and profitability were hypothesized.

This model was tested in Egyptian ICT companies and measured the perceptions of managers to the proposed model. A self-administrated questionnaire delivered and collected by hand was used to collect the data to examine the hypothesized relationships. A total of 190 valid responses were used for quantitative analysis.

A key finding of this study, which is based on factor analysis, indicated that all proposed indicators were loaded on their factors. This emphasizes that the three proposed phases can be effectively measured and managed using the proposed indicators (see table 6). The quantitative analysis using ordinal regression also showed one of the most important results which was, the integration between the three proposed phases and related indicators were associated with profitability. Moreover, it suggested that the best model was that containing all three phases as it predicted a higher level of profitability and its variables were most strongly associated with the profitability. It can be suggested that Egyptian ICT companies that strategically mange intellectual assets should manage the three phases together (analyzing and evaluating the current status of intellectual resources and activities, identifying proposed intellectual activities and evaluating results) in a coherent model in order to improve their profitability. Such management require managers of ICT sector to use the proposed financial and non- financial indicators for each phase to manage intellectual capital assets effectively for the purpose of improve profitability.

As with any study, there are limitations. As this study was conducted only in a single country and

in a single sector that of the Egyptian ICT sector, whilst this is one of the most appropriate sectors for the proposed profitability model, such a focus could be viewed as a limitation. The findings of this study are influenced by the particular nature and characteristics of the Egyptian ICT sector. Therefore, the generalization of findings beyond the Egyptian ICT sector should be made with caution. Therefore, developing generalization of the findings of this study is a fruitful and interesting area for future research. This can be achieved by conducting further empirical research to explore the relationship between the three phases and profitability across a broad range of Egyptian industries and a broad range of different countries to validate these initial findings and to establish the extent of generalization possible. However, the results obtained from this study highlight the positive role of managing intellectual assets in enhancing the profitability of Egyptian ICT companies. Thus, it can be argued that developing a model to manage intellectual assets is more important than managing intangible assets in ICT sector. In addition, managers of ICT companies should realize that managing intellectual capital is one of the most significant driver for driving growth. The proposed model help ICT manager to recognize the importance of using the financial and non-financial indicators in managing intellectual capital. The application of proposed model can facilitate the management of intellectual assets and hence improve the profitability of ICT companies.

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