



Using Modeling in Intellectual Capital

Mahmoud Nadim Nahas

Mechanical Engineering Department, King Abdulaziz University, Jeddah, Saudi Arabia

Email address:

mnahas@kau.edu.sa

To cite this article:

Mahmoud Nadim Nahas. Using Modeling in Intellectual Capital. *American Journal of Engineering and Technology Management*.

Vol. 1, No. 2, 2016, pp. 7-11. doi: 10.11648/j.ajetm.20160102.11

Received: July 13, 2016; **Accepted:** July 22, 2016; **Published:** August 6, 2016

Abstract: Intellectual capital includes many aspects such as economical, emotional, psychological, social and human characteristics. It also comprises different specializations such as informatics, accounting and financing. It may be dealt with at individual level, organizational level or environmental level. Since knowledge has become on the top of the social as well as the economic interests, scientists confirms the need to develop the researches to deal with knowledge issues to make it one of the financial assets of all organizations. Knowledge now is looked at as real measurable capital that can be initiated, stored, transferred and shared. This paper discusses the general framework of the intellectual capital, and proposes a model to deal with its complexities. The present model is comprehensive as it includes some aspects that are ignored in the study of the intellectual capital. It includes the psychological and the social items that lead to the integration of issue of the intellectual capital.

Keywords: Intellectual Capital, Human Capital, Organizational Capital, Environmental Capital, Knowledge, Modeling

1. Introduction

Intellectual capital is one of the modern subjects that interests some researchers on the scientific and application levels [1]. It attracts all different organizations; academic, governmental and non-governmental organizations alike [2]. International Federation of Accountants considers the intellectual capital as if it is the share of the knowledge economy in any organization [3]. Although there is a sort of common agreement on the components of the intellectual capital, however, there is no specific definition for it [4]. One possible definition is [5]: the intellectual capital is the economic value for two non-tangible assets; the organizational capital and the human capital, which includes the experience and the skills of all the staff of the organization [6]. Other researchers added a third item related to the customers/dealers capital [7-8], while some others divided the capital into internal capital (related to the organization) and external capital (related to the customers/dealers) [9-11]. There are also some other classifications [12-16].

The importance of the intellectual capital is not in need to any proof. It has been discussed in many studies, and a conclusion is reached that the intellectual capital develops both the work and the capital at the same time [1].

Some researchers point out that most of the definitions of the intellectual capital are of wide range, to the extent that it may be difficult to distinguish between the items included, thus affecting the suitable formatting of the concept of the intellectual capital and the relations between its aspects [17]. This has introduced some difficulty for some executive managers in utilizing the concept of the intellectual capital in their organizations. [18-20].

To evaluate the importance of the intellectual capital, some researchers have introduced some metrics to measure the intellectual capital, such as the added values (the economic added value and the market added value... etc).

Studies that are more recent concentrate on the relationship between the components of the intellectual capital. For instance, how organizational value are created and how human capital can be measured [21], while [22-23] addressed intellectual capital in the public sector and found that it is the least discussed. Olender et al. [24] discussed how to protect intellectual capital to reduce knowledge leaking via employees. An interesting paper on the viewpoints of university academic staff of European countries concerning the connecting of the intellectual capital within social networks is presented in [25].

2. The Components of the Intellectual Capital

Many researchers concentrate on the economic importance of the intellectual capital, while some others focus on its components. These components are:

- Human or Individual Capital.
- Structural or Organizational Capital.
- Environmental or Customer Capital.

3. Modeling Intellectual Capital

There are many models for the Intellectual Capital. The simplest one is that presented by Stewart [7], which is shown in Fig. 1.

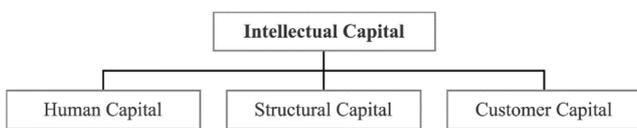


Fig. 1. Stewart Model [7].

Petrash [10], used same components to present his model, where these components form the "Value" for the organization. His model is shown in Fig. 2.

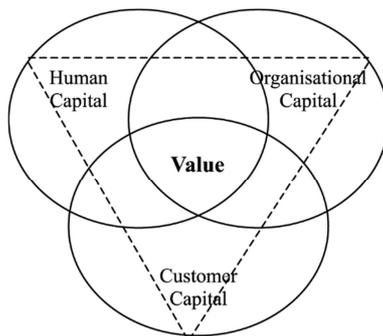


Fig. 2. Petrash Model [10].

Edvinsson and Malone [14] introduced the "Market Value", which consists of the Financial Capital and the Intellectual Capital, as shown in Fig. 3. The Intellectual Capital here is divided into Human Capital and Structural Capital, where the latter is divided into Customer Capital and Organisational Capital, which, in turn, is divided into Innovation Capital and Process Capital.

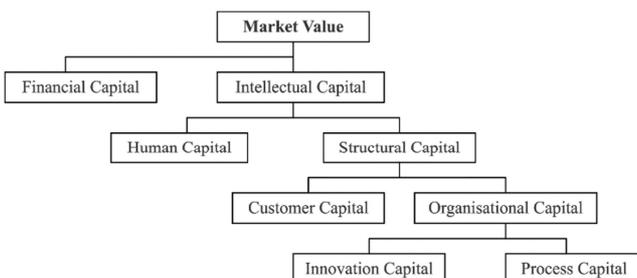


Fig. 3. Edvinsson and Malone Model [14].

There are some more models mentioned in [5] and [26].

4. The Present Model

The present model is based on Akhilesh definition of the Intellectual Capital [18], where each component of the three mentioned components is divided into two subcomponents as shown in Fig. 4. The subcomponents are:

- The Human or Individual Capital is divided into:
 - The knowledge and skills of the individuals.
 - The personal characteristics of the individuals.
- The Structural or Organizational Capital is divided into:
 - Organizational knowledge.
 - Organizational personality.
- Environmental or External Capital is divided into:
 - Environmental knowledge.
 - Environmental sensitivity.

The components and subcomponents are detailed below.

5. The Human or Individual Capital

This is divide into two subcomponents, the first is related to the knowledge, qualifications, skills and expertise of the individual personnel working in the organization, whether they gain their knowledge and skills from their present organization or from their previous affiliations. This a real asset for the organization which is added to its market value. However, some of the knowledge and skills of individuals may be different from the main stream of the organization. However, with little training, they are re-directed to the desired track. Individual experience accumulates over time, skills tend to get better with more practice, qualifications tend to build up due to training, and knowledge levels move forwards. This is why the successful organizations offer different distinctive benefits to keep their staff and prevent them from leaking to other organizations.

The other subcomponents of the human capital is the personality attributes of the individuals. This includes their willingness and ability to learn about new subject or product, their performance, their cooperation with other staff, their personal initiatives, their independency and capability to take the right decision, their rational thinking, their emotional stability, their self-motivation to achieve success... etc. These attributes contribute to the strength and the value of the organization. However, these qualities cannot be discovered from the CVs of the people, but some of them may be discovered during the interviews or from the recommendation letters given by a university supervisor or a previous boss, if these recommendation letters are obtained confidentially.

6. The Structural or Organizational Capital

The Structural or Organizational Capital is also split into two sub-constituents. These are the Organizational

Knowledge and the Organizational Personality. The former one includes the collective knowledge that the organization has gained so far. This is different from the knowledge of the individuals. It is the knowledge that remains even if the personnel have changed. Examples of this knowledge are: the by-laws of the organization and its regulations, its hierarchical structure, databases, information systems, ready programs, trademarks, patents, trade secrets, intellectual property, copyrights, education and training rights, licenses. etc. These items give the organization its unique character, and are of direct value added to the market value of the organization.

The other branch, which is related to the Organizational Personality, includes the behavior of the organization in different situation, its vision and mission, its moral values and objectives, its norms in dealing with its staff and others, and its standard in performing duties. This is the emotional relationship between the organization and others and measures organizational commitment. This is a very important component since it affects the satisfaction and commitment of the personnel as well as the customers. As for the personnel, the satisfaction is measured whether they are happy, while their commitment measures whether they are willing to stay working in the organization. Both satisfaction and commitment influence the work attitudes and hence generate value for the organization. Individual capability is of potential value for the organization. However, it creates actual value through its use. Only satisfaction and commitment ensure that employees will actually use their knowledge to create value for the organization.

7. The Environmental or External Capital

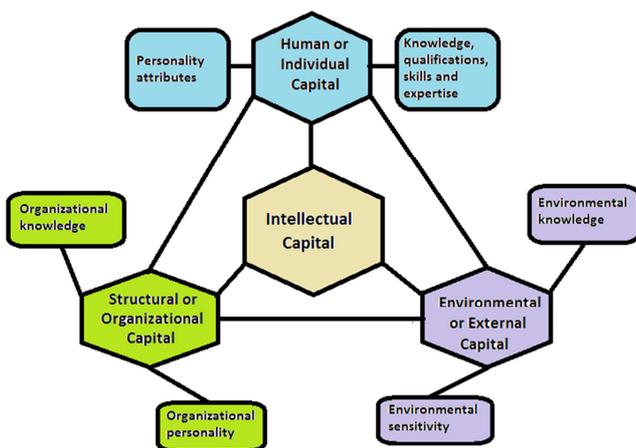


Fig. 4. Present Model.

The Environmental or External Capital is also of two branches. The first one is the Environmental Knowledge, which consists of the relations with the stakeholders. Those are the customers and the dealers, the suppliers, the shareholders, the nearby educational establishment, the regional and national government agencies, the allies,

partnerships. etc. The environmental knowledge also include the databases related to the market, the market requirements, the competitors, the other trademarks, the service companies. etc.

The second branch of the environmental capital is related to the Environmental Sensitivity. This element includes the policies of dealing with the stakeholders, the customers, the competitors... etc. It also includes the market research, the dealing with the new technologies, the commitment of the organization towards the local, regional and national communities. It is to be noted that the environmental knowledge increases the market value of the organization on the short term, while the environmental sensitivity increases the market value on the long term.

8. Interference Between the Intellectual Capital Components

The aforementioned components of the intellectual capital interfere with each other in a harmonic way. No doubt that the knowledge of the individuals is transferred to the organization, and vice versa. If this does not happen, then how can the individuals increase their experience and skills, and how can the organization benefit from its staff? Also, the organization that has vision, mission, objectives and moral values feed them to its personnel and change their attributes, while the individual attributes are also reflected in the collective values of the organization. The internal environment of the organization affect its way of dealing with the external environment, while the external environment dictates on the organization to adjust its policies for its sustainability. The market itself impose some requirements on the products and services that are needed, while the public relations and the advertisements may direct the customers to demand the products and the services of the organization.

9. Managing Intellectual Capital

Organizations should measure and report their intellectual capital to aid strategy formulation, development and decision-making; and to evaluate strategy execution. Employees and stakeholders would always like to see the intellectual capital report. Managing the intellectual capital in the right way enables the organization to increase innovation and productivity. This is because the management will be in a better position to normalize the right payment to the employees who are the most important asset, as they are the source of creativity, innovation, and improvement. These items represent the opportunity to add value for the intellectual capital.

10. Application of the Model

The Intellectual Capital (IC) is the total of all the components, i.e. $IC = HC1 + HC2 + OC1 + OC2 + EC1 + EC2$

where the definitions of the terms are given in Table 1, which gives an example of how the present model can be simulated.

To evaluate the market value of the organization, the total number of points are first summed up, and then the values of each point can be estimated according to the market values of other organizations. The points scheme suggested in Table 1 can be altered according to the organization

merit. Table 1 also serves as a guide of how the organization management can increase the added-value of each items to increase IC efficiency. The organization management can use the simulation table to identify the value of their employees via their capabilities and how they can be rewarded for their activities to create value for the organization, which make the organization achieve its strategic goals.

Table 1. Example of simulation of the present model.

Human Capital, HC	knowledge and skills of the individuals, HC1 (points refer to each individual)	Knowledge	Basic knowledge: 10 points.
			Intermediate knowledge: 20 points.
			Good knowledge: 30 points
		Qualifications	No certificate: 10 points.
			Diploma: 20 points.
			BSc: 30 points.
			MSc: 40 points
Skills	10 points for each item of: quality, efficiency, professional capability		
Experience	10 points for each year of experience		
personal characteristics of the individuals, HC2 (points refer to each individual)	10 points for each item of: ability to learn, performance, cooperation with others, initiatives, independency and capability to take the right decision, rational thinking, emotional stability, self-motivation to achieve success		
Organizational Capital, OC	organizational knowledge, OC1	1000 points for the presence of each item of: by-laws and regulations, hierarchical structure, databases, information systems, ready programs, trademarks, patents, trade secrets, intellectual property, copyrights, education and training rights, licenses	
	organizational personality, OC2	1000 points for the presence of each item of: vision, mission, values, objectives, norms, standard to perform duties, personnel satisfaction, personnel commitment, customer satisfaction, customer commitment.	
Environmental Capital, EC	environmental knowledge, EC1	1000 points for the good relations with customers, dealers, suppliers, shareholders, nearby educational establishment, regional government agencies, national government agencies, allies, partners, databases related to the market, competitors, other trademarks, service companies.	
	environmental sensitivity, EC2	1000 points for the presence of each item of: policies of dealing with stakeholders, customers, competitors, market research, new technologies, commitment towards the local, regional and national communities.	

11. Conclusions

The present model enables any organization to establish its own percentage of each component of the intellectual capital and work accordingly to increase its market value through increasing these components along the time. Once it is well established, individuals would like to be affiliated with it. On the other hand, it will be selective in recruiting personnel, where only staff of high human capital (with best knowledge, skills and attributes) will be employed, hence it may be able to grasp better environmental knowledge and wider external capital. It is to be noted that competitor organizations are doing the same, and may attract better personnel and customers. However, governmental organizations may not have competitor; but still, the administration of such organizations should also think about improvement of the work and try to increase their intellectual capital. British governmental agencies, which offer services to the people, work now to

satisfy the public as if they are private companies seeking to satisfy customers. The present model will help any organization about taking decision concerning important issues such as acquisition of another organization, incorporation with another body, establishing partnerships, forming strategic alliances, or making contract with like-with-like group.

References

- [1] Petty, P., Guthrie, J. (2000). Intellectual Capital Literature Review: Measurement, Reporting and Management, *Journal of Intellectual Capital*, Vol. 1, No. 2, pp. 55-75.
- [2] OECD (1999). Guidelines and Instructions for OECD Symposium, Paper presented at *International Symposium Measuring Reporting Intellectual Capital: Experiences, Issues, and Prospects*, OECD, Amsterdam.
- [3] International Federation of Accountants (1998). *The Measurement and Management of Intellectual Capital*, IFAC, New York, USA.

- [4] Leon, M. V. S. (2002). Intellectual Capital: Managerial Perceptions of Organizational Knowledge Resources, *Journal of Intellectual Capital*, Vol. 3 No. 2, pp. 149-66.
- [5] Tan, H. P., Plowman, D. and Hancock, P. (2008). The Evolving Research on Intellectual Capital, *Journal of Intellectual Capital*, Vol. 9, No. 4, pp. 585-608.
- [6] Sveiby, K. E. (2001). A Knowledge-Based Theory of the Firm to Guide in Strategy Formulation, *Journal of Intellectual Capital*, Vol. 2, No. 4, pp. 344-58.
- [7] Stewart, T. A. (1997). *Intellectual Capital: the New Wealth of Organizations*, London, UK.
- [8] Roos, J., Roos, G., Dragonetti, N. C. and Edvinsson, L. (1997). *Intellectual Capital: Navigating the New Business Landscape*, Macmillan Press, London, UK.
- [9] Brooking, A. (1996). *Intellectual Capital*, Thomas Business Press, London, UK.
- [10] Petrash, G. (1996). Dow's Journey to a Knowledge Value Management Culture, *European Management Journal*, Vol. 14, No. 4, pp. 365-73.
- [11] Sveiby, K. (1998). Intellectual Capital: Thinking Ahead, *Australian CPA*, June Issue, pp. 18-22.
- [12] Kaplan, R. S. and Norton, D. P. (1992). The Balanced Scorecard – Measures that Drives Performance, *Harvard Business Review*, Vol. 70, No. 1, pp. 71-9.
- [13] Haanes, K. and Lowendahl, B. (1997). In Thomas, H. (Eds), *The Unit of Activity: Towards an Alternative to the Theories of the Firm, Strategy, Structure and Style*, Wiley, Copenhagen.
- [14] Edvinsson, L. and Malone, M. (1997). *Intellectual Capital: Realizing Your Company's True Value By Finding Its Hidden Brainpower*, Harper Collins, New York, USA.
- [15] DCTU (1999). Your Knowledge – Can you Book it?, Paper presented at the *International Symposium Measuring and Reporting Intellectual Capital: Experiences, Issues, and Prospects*, OECD.
- [16] Lowendahl, B. (1997). *Strategic Management of Professional Service Firms*, Handelshøjskolens Forlag, Copenhagen.
- [17] Marr, B. and Mustaghir, K. (2005). Defining Intellectual Capital: a Three Dimensional Approach, *Management Decision*, Vol. 43, No. 9, pp. 1114-1128.
- [18] Akhilesh, K. (2008). Modelling Intellectual Capital from a Bottom-Up Perspective, the 5th *International Conference on Intellectual Capital, Knowledge Management and Organizational Learning*, New York, USA, 9-11 October 2008.
- [19] Contractor, F. G. (2001). *Valuation of Intangible Assets in Global Operations*, Quorum Books, Westport, USA.
- [20] Bontis, N. (1996). Intellectual Capital: an Exploratory Study that Develops Measures and Models, *Management Decision*, Vol. 36, No. 2, pp. 63-76.
- [21] Massingham, P. R., and Tam, L. (2015). The Relationship between Human Capital, Value Creation and Employee Reward, *Journal of Intellectual Capital*, Vol. 16, No. 2, pp. 390-418.
- [22] Guthrie, J., Ricceri, F. and Dumay, J. (2012), Reflections and Projections: a decade of intellectual capital accounting research, *The British Accounting Review*, Vol. 44 No. 2, pp. 68-92.
- [23] Guthrie, J., and Dumay, J. (2015), New Frontiers in the Use of Intellectual Capital in the Public Sector, *Journal of Intellectual Capital*, Vol. 16, No. 2, pp. 258-266.
- [24] Olander, H., Hurmelinna-Laukkanen, P., and Heilmann, P. (2015), Human Resources – Strength and Weakness in Protection of Intellectual Capital", *Journal of Intellectual Capital*, Vol. 16, No. 4, pp. 742-762.
- [25] Vătămănescu, E. M., Andrei, A. G., Dumitriu, D. L., and Leovaridis, C. (2016). Harnessing Network-Based Intellectual Capital in Online Academic Networks: from the Organizational Policies and Practices towards Competitiveness, *Journal of Knowledge Management*, Vol. 20, No. 3, pp. 594-619.
- [26] Leliaert, P. J. C., Candries, W. and Tilmans, R. (2003). Identifying and Managing IC: a New Classification, *Journal of Intellectual Capital*, Vol. 4, No. 2, pp. 202.