



Assessing the link between Intellectual Capital Formation and Performance of a University

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ABSTRACT

The resource-based view (RBV) of the firm grew out of frustration with the structure-conduct-performance paradigm of the industrial organization (IO) view of the firm and the early RBV theorists found the IO view – that a firm's success was wholly determined by its external environment – to be unrealistically limited and constraining. This paper is an attempt to apply the RBV of the firm to university settings and it looks at the process of Intellectual Capital (IC) formation of a university as the basis for its performance. The paper deals with the issues of IC formation, its measurement, definition of a university's performance, its measurement and the association between the two. The paper provides an overview of the various RBV theories along with a detailed discussion on the notions of strategy, resources, capabilities, competencies and creation of competitive advantage of a firm with special emphasis on the role of human capital in sustaining this competitive advantage. While applying the RBV in Education industry, the four schools of University of Management & Technology (UMT) Lahore are studied in the light of RBV. The paper also highlights the limitations of the current study along with some of the future research implications for the human capital-RBV link.

Key Words: Intellectual capital; Resource base view; Industrial organization; Human capital

JEL Classification: A20; I20; L10

INTRODUCTION

The resource-based view (RBV) of the firm grew out of frustration with the structure - conduct -performance paradigm of the industrial organization (IO) view of the firm and the early RBV theorists found the IO view - that a firm's success was wholly determined by its external

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* The material presented by the author does not necessarily portray the view point of the editors and the management of Iqra University, Karachi.

environment - to be unrealistically limited and turned to the seminal work of Penrose (1959) for motivation (Russo and Fouts, 1997). The biggest contribution of Penrose (1959) is to provide base for understanding the causal links among resources, capabilities and competitive advantage of a company, Penrose provides three key arguments concerning these linkages (Kor and Mahoney, 2004). First of all Penrose (1959) asserts that firms cannot create economic value for themselves merely by possessing resources, rather it's the effective and innovative management of these resources that creates economic value for the firm. Secondly, Penrose highlights managers or human capital as the main causal link in the conversion of firm's resources into firm capabilities and new product development. Thirdly, through the use of the drivers of the rate and direction of firm growth, Penrose provides an explanation of the link between resource-based view of the firm and its performance. Fourth key contribution of Penrose is the stress on the importance of continuous maintenance of firm's existing capabilities in protecting its competitive advantage from getting eroded. Penrose argues that if a firm keeps on investing in renewing its capabilities through new resource combinations, then the firm's competitive advantage can be sustained.

This paper attempts to apply the RBV of the firm to university settings and looks at the Intellectual Capital (IC) formation of a university as the basis for its performance. The paper deals with the issues of IC formation, its measurement, definition of a university's performance, its measurement and the association between the two.

This paper is divided into five sections. The first section provides an overview of the various RBV theories along with a detailed discussion on the notions of strategy, resources, capabilities, competencies and creation of competitive advantage of a firm with special emphasis on the role of human capital in sustaining this competitive advantage. The second section briefly describes the evolution of RBV concepts over the years while the third section discusses RBV application in the Education industry. Section four of the paper defines university performance, its measurement and, performance of the three University of Management & Technology (UMT) schools in the light of RBV. The fifth section highlights the limitations of the current study along with some of the future research implications for the human capital-RBV link.

Section One

Resources & Capabilities

The RBV of a firm can be understood as a tradition emphasizing the company's internal competencies and capabilities as the fundamental building blocks of strategy. Central to this theme is the idea that firms' possess heterogeneous resources and capabilities, which account for difference in performance (Juga, 1999). But before understanding the role of resources and capabilities in the creation of competitive advantage for the firms, it will be worthwhile to differentiate between these two closely linked and subtly different constructs.

A number of definitions and classifications schemes of resources have been suggested (Hooley, Broderick and Moller, 1998; Capron and Hulland, 1999) and following are some examples of these definitions:

Wernerfelt (1984): Anything that can be thought of as a strength or weakness of a firm.

Amit and Schoemaker (1993): Stocks of available factors that are owned or controlled by the firm.

Grant (1991): As inputs to the production process.

Barney (1991): As a bundle of assets, capabilities, organizational processes, firm attributes, information and knowledge.

Day (1994): Assets are the resource endowments the business has accumulated e.g. investments in plant, brand equity while capabilities are the glue that binds these assets together and enables them to be successfully deployed to the advantage of the firm. Capabilities are complex bundles of skills and collective learning, exercised through organizational processes that ensure superior coordination of functional activities.

Teece et al. (1992): Defines capabilities as the abilities of an enterprise to organize, manage, coordinate or undertake specific sets of activities.

Selznick (1957): Defines the notion of core or distinctive competencies as what a firm does particularly well in relation to its competitors.

Wang and Lo (2004): Core competencies are the skills that enable a firm to deliver a fundamental customer benefit by enabling the firm to establish, enhance, upgrade and utilize proprietary access to those resources that lead to sustainable competitive advantage.

Prahalad and Hamel (1990): Core competencies are those competencies that make a disproportionate contribution to ultimate customer value and provide a basis for entering new markets.

Teece et al. (1992): Also talk of "dynamic capabilities" referring to the capacity of a company to renew, augment and adapt its core competence over time.

Grant (1991) suggests a key difference between resources and capabilities; on their own resources like capital equipment, skills of individual employees, patents, brand names, finance and so on are not productive and it is the firm's organizational capabilities - its abilities to assemble, integrate and manage these bundle of resources which become crucial in understanding how competitive advantage is conferred upon firms (Russo and Fouts, 1997). According to Grant (1991) productivity requires coordination and cooperation among these resource or asset teams and a capability is the capacity for a team of resources to perform some task or productive activity and, "while resources are the source of a firms' capabilities, capabilities are the main source of its competitive advantage". Recent researchers have strengthened this view by emphasizing firm capabilities' "as more intangible and inimitable resources, which stem from the integration of resources that are more likely to produce a competitive advantage, because such capabilities are often rare and socially complex" (Cui and Lui, 2005). According to other researchers, "the firm's capabilities constitute what it can do as a result of bundle of resources working together...to effectively coordinate its complex human and non human resources in order to achieve corporate performance" (Chan, 2005), these capabilities cannot be given monetary value and are so deeply embedded in the organizational routines and practices that they cannot be traded or imitated easily (Ozsomer and Genctiirk, 2002). Other researchers make the distinction between assets and capabilities where they define capability or competence as

'the know-how' needed to build assets and sometimes refer to it as 'dynamic capability' (Markides and Williamson, 1996). Since competitors cannot simply buy this 'know-how' (created over time in a path dependent process that makes it inextricably interwoven into the firm) without acquiring the entire firm, it becomes theoretically impossible for the competitors to imitate completely (Pettus, 2001).

Classification of Competencies

According to Day (1994), functional competencies of a company are classified as outside-in, inside-out and spanning capabilities (Hooley, Broderick and Moller, 1998).

Outside -in competencies are those skills and abilities which enable a company to understand its environment and customers and create close links between the 'outside' (environment) and 'inside' (resources endowments) of the company. These competencies create 'market sensing' skills or the abilities of the company to assess and foresee changes occurring in its markets.

Inside -out competencies are the internal capabilities of the firm and include;

1. Human resources and their management
2. Financial management
3. Cost controlling skills
4. Technological skills
5. Logistics management
6. Manufacturing process management

On similar lines Grant (1991) classifies resources into the following six categories:

1. Financial resources
2. Physical resources
3. Human resources
4. Technological resources
5. Reputation
6. Organizational resources

Spanning or integrating competencies bring together the inside-out and outside-in competencies to ensure delivery of products and services to the customers.

Strategy and RBV

Strategy is defined as, "the match an organization makes between its internal resources and skills...and the opportunities and risks created by its external environment" (Grant, 2001). In recent times RBV has become one of the most influential frameworks in the strategic management literature (Lavie, 2006; Dahan, 2005) and the fundamental question in this field is how firms achieve and sustain competitive advantage (Juga, 1999). The main theme of the resource-based theorists suggests that a sustainable firm strategy (and performance) is strongly embedded in

its resources and capabilities (Hooley, Broderick and Moller, 1998) and that these diverse, hard to copy resources and capabilities provide the basis of strategic advantage and superior firm performance (Lado, Boyd, Wright and Kroll, 2006). The resource-based literature strongly places a firm's unique bundle of resources as the major antecedent of its strategy and performance (Chan, 2005).

But during 1980s, due to Michael porter's influence, the major developments in strategic area focused on the link between strategy and external environment of a company and the link between strategy and internal firm resources and skills suffered comparative neglect (Grant, 1991). It was towards the later half of 1980s that increased interest in firm specific variables became apparent (Fahy, 2000; Fahy and Hooley, 2002) which then resulted in positing a firm's resources as the foundation for firm strategy and Grant (1991) suggest the following 5 step model to capture the importance of resources and capabilities in the formulation of a company's strategy:

1. identification and classification of firm's resources
2. identification of a firm's capabilities and identification of resources inputs to each capability
3. appraising the rent generating potential of resources and capabilities in terms of their potential for creating sustainable competitive advantage
4. selecting a strategy which best fits the firm's resources and capabilities relative to external opportunities and
5. identification of resource gaps and investing to replenish and upgrade firm's resource base

RBV & its link with Competitive Advantage

RBV is not a brand new concept and one might suggest that it is mere common sense (O' Riordan, 2006). But an awareness of how RBV can be applied to create competitive advantage in the companies has gained popularity in recent times and key writers on the subject speak of VRIO (Value, Rarity, Imitability and Organization) framework which started gaining strength from researchers like Barney, Grant and Lado. According to Barney (1991) a resource will create sustained competitive advantage if it is inimitable, valuable, rare and non substitutable (Lado et al., 2006; Cui and Lui, 2005; Carter and Ruefli, 2006). Grant (1991) points towards four characteristics of resources and capabilities that determine the sustainability of the competitive advantage of a firm. These characteristics include:

1. **Durability :** Firm capabilities have the potential to be more durable than the underlying resources. A durable resource or capability would be capable of being maintained over a long period of time (Carter and Ruefli, 2006) and would therefore be critical in creating and sustaining the competitive advantage of a firm.
2. **Transparency:** If a firm wishes to imitate the strategy of a rival firm, it must first establish the capabilities which underlie the rival's competitive advantage, and then it must determine what resources are required to replicate these capabilities, this transparency of the competitive advantage of a firm would be less obvious in cases of multiple competencies and capabilities interacting to create competitive advantage.

3. **Transferability:** Since most resources and capabilities are not freely transferable among firms, therefore the rivals find it difficult to acquire exactly the same resources and capabilities needed to replicate the competitive advantage of an incumbent firm. This imperfection in transferability of resources and capabilities help protect the competitive advantage acquired by a firm over a period of time.
4. **Replicability:** When the capabilities are less easy to replicate then the resulting competitive advantage would be more difficult to imitate.

These above mentioned characteristics of resources and capabilities are captured by Barney (1991) as - value, rarity, imperfect Imitability and imperfect substitutability (Ray et al., 2005; O'Riordan, 2006).

A key concept in explaining the sustainability of competitive advantage through the RBV is the 'isolating mechanism' or resource-position barriers (Lavie, 2006; Poppo and Weigelt, 2000) which are in essence the strategies developed by the firms to reduce other firms' abilities to compete directly with them and the firms discourage, delay, or thwart other firms' attempts to compete by erecting isolating mechanisms such as favorable corporate reputations that are unlikely to be imitated or substituted (Carter and Ruefli, 2006). Indeed, imitability is perhaps the most important predictor of organizational performance as a firm can obtain unusual returns only when other firms are unable to imitate its resources and capabilities, otherwise these resources and capabilities would be less rare or valuable, and substitutability would become irrelevant (Miller and Shamsie, 1996).

Some researchers strongly connect firm capabilities with its strategy and Stalk et al. (1992) define a capability, "as a set of business processes strategically understood; hence, the company's competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to the customer" (Juga, 1999). It is interesting to note that capabilities and competencies enables the activities in a business process to be carried out which in turn creates the 'isolating mechanisms' ensuring that the resulting competitive advantage is sustainable over time and does not get eroded - as it is based on capabilities which are valuable, hard to copy, relatively rare and difficult to transfer and adopt. Research suggests that resources that are valuable, but can be imitated, can only serve as the basis for a short-term competitive advantage but for this advantage to be sustainable over time, the resources must also be inimitable and non-substitutable (Sarason and Tegarden, 2003).

The following analogy will further clarify some concepts of RBV:

"A firm's tangible resources are analogous to the vast number of genes (in a human cell). The business and process backbones within the firm are like the helix...they support strategic assets through decisions, organizational policies, procedures, and practices to create products and services. Capabilities, competencies and routines are knowledge assets and are analogous to the gene's hydrogen bonds. They hold the tangible resource genes together and are crucial in creating strategic assets. Akin to cells protecting their genomes through cellular structures and processes,

firms protect their assets through isolating mechanisms such as history and causal ambiguity. The strategic assets are equivalent to the chromosomes. Strategic assets are as unique to each firm as a genetic blueprint for reproduction is to each person" (Jugdev, 2004).

Role of Human Capital in the creation of Competitive Advantage

According to Penrose (1959), managers' experience with their firm resources produces firm-specific knowledge about the productive opportunities that are unique for that firm (Kor and Mahoney, 2004). This experience based knowledge is crucial as it is proprietary and cannot be transferred to new managers quickly, and also cannot be purchased readily from the market. She also notes that firm-specific shared experience in the top management team produces tacit knowledge and that this collective knowledge at top ranks strongly influences managers' abilities to function as a team and serves as a competitive advantage (since this collective knowledge serves as an isolating mechanism as compared to those firms who do not possess this brand of knowledge) for the company.

The relevance of top management team (TMT) in the field of pioneering - the capacity of the firm to develop new products ahead of rivals - has been proved empirically and it is shown that TMT represents one particular human capital resource that potentially differentiates between pioneering and non-pioneering firms (Flood, Fong, Smith, O'Regan, Moore and Morley, 1997).

Strategic human resource management (SHRM) is a means of gaining competitive advantage through one of a company's most important asset: its people (Richard, 2000), the other sources of competitive advantage like technological and physical resources are comparatively easier to emulate and transfer. Therefore, the crucial differentiating factor between companies can be how human resources are developed and nurtured in a particular organization. The notion of human capital is based on the theme that people have skills, experience, and knowledge - all hard to copy and imitate - that provide superior performance and competitive advantage to that company. If the human capital creates value, remains hard to imitate and is rare, then it certainly contributes as the main source of competitive advantage and superior firm performance (Saaperez and Garcia - Falcon, 2002; Lee, Phan and Chan, 2005). Researchers have pointed out that women and racial/ethnic minorities bring diverse (and hard to copy) insights and cultural sensitivities, which in turn creates competitive advantage for companies pursuing different and new markets (Cox, 1994).

Human capital has long been argued as a critical resource in most companies and recent research suggests that human capital attributes like education, experience and skills and, particularly the attributes of TMT affect firm performance and the empirical relationship between human capital and performance is documented by many writers (Hitt et al., 2001).

Section Two

Evolution of RBV

This section briefly describes evolution of the RBV concept over the years along with some lacunas identified in the research.

The traditional view of RBV is based on the assumption that resources that create competitive advantage for firms, must be owned and controlled by the firms. However, in recent years, evidence suggests that resources of alliance partners transferred through direct inter firm interactions have a considerable impact on firm performance. The fundamental assumption of the RBV, according to which firms must own or at least fully control the competitive advantage conferring resources, turns out to be incorrect (Lavie, 2006).

Traditionally, RBV was developed to understand the conditions under which firms gain and sustain a competitive advantage, more recent researcher have however, shown RBV to be also applicable at the firm's process -level to be effective in creating advantage for the firms and many studies in the IT industry have confirmed this view (Ray, Muhanna and Barney, 2005).

The RBV has also been applied to understand why family firms are in better position than non-family firms to understand the entrepreneurial opportunity recognition. Research shows that organizational culture, in case of family firms, becomes an important strategic resource and helps firms gain a better and deeper understanding of the entrepreneurial issues (Zahra, Hayton and Salvato, 2004).

The literature points out one lacuna in the RBV, it is said that RBV is essentially a static theory as it concentrates on identifying resources at one point in time. However, a recent extension of RBV, the dynamic capabilities view (DCV) focuses on the capacity an organization facing a rapidly changing environment has to create new resources. Current strategic management literature incorporates the DCV perspective in showing that RBV could be extended to apply to corporate-level strategy in addition to its traditional application at the SBU level (Bowman and Ambrosini, 2003).

Lado et al. points out that critics view RBV logic as paradoxical, and "the ability to measure a resource means that this resource will be less likely to be a source of sustained competitive advantage" (Lado et al., 2006). Another paradox highlighted by them is that if the basic ambit of RBV that there cannot be 'rules for riches' is to be believed, then how it (RBV) can be used to generate managerial prescriptions to achieve competitive advantage? Similarly, causal ambiguity - the relative difficulty of understanding causal links between organizational resources and performance also implicates that managers are limited in their ability to understand the sources of sustained competitive advantage. But Lado et al. (2006) exonerate the RBV and declare that, "taking the view that paradox is embedded in scientific epistemology, we have argued that researchers can work within and through the RBV paradoxes to advance understanding, rather than insist on theoretical purity via Popperian falsification.....RBV paradoxes might reflect scientific anomalies that should be tolerated, as long as this theoretical perspective continues to produce interesting insights".

Section Three

RBV, Firm Performance and its application in the Education Imparting Institutions

Empirical studies of firm performance using the RBV have found differences not only between firms in the same industry but also within the narrower confines of groups within the industries,

suggesting that the effects of individual, firm-specific resources on performance are significant (Wade and Hulland, 2004).

According to resource-based view of the firm, a firm's competitive strategies and performance depend significantly on its organizational resources and capabilities (Barney, 1991; Grant, 1991). Recent researchers are now extending the traditional RBV towards a natural-resource-based view of firms (NRVF) to develop firm-specific competitive advantage by tactfully managing firm's relationship with natural environment and it is theorized that due to increasingly stringent constraints imposed by the natural environment, the firm's ability to deal with these constraints is valuable, rare, and imperfectly imitable organizational capabilities, and consequently lead to superior economic and social outcomes (Chan, 2005).

The literature on diversification of businesses also relies on RBV to create competitive advantage and superior performance for the diversified firms. The following paragraph highlights this issue:

"The fact that superior performance of diversification depends on opportunities to share strategic assets has...important implication....The longevity of the competitive advantage (superior performance) will be greater the less substitutable the asset and the more its replication suffers from impediments to accumulation...or from Rumelt's 'isolating mechanisms'" (Markides and Williamson, 1996; Knott, Bryce and Posen, 2003).

Researchers have also highlighted link between RBV and performance in companies relying on Total Quality Management (TQM) techniques to gain superiority than their competitors. The basic argument is that TQM can contribute to the improvement of performance by encouraging the development of assets that are specific, produce socially complex relationships, are embedded in the company history and culture and generate tacit knowledge (Tena, Llusar and Puig, 2001).

RBV Applied to Education Imparting Institutions

Recent researchers have focused on applying RBV paradigm to knowledge-intensive industries like schools, colleges and universities and they have noticed that, "for many organizations working within knowledge-intensive industries, perhaps the most critical asset they possess never appears on the balance sheet, namely intellectual capital (IC). This intangible asset represents organizational processes, human know-how, and relationships that support or create wealth for the company...the RBV constitutes.... inside-out model where strategic planning begins through the identification of internal resources that fit a matching external environment" (Herremans and Issac, 2004).

While applying RBV to Britain's higher education institutions (HEIs), researchers at Middlesex University Business School (UK) note, "When a university's resources are analyzed from an application-based RBV perspective, it becomes clear that the people component of its resource base becomes fundamental...if a university fails to invest in developing its staff, particularly in capacity building in research teams, it will not succeed in developing knowledge to which it can then claim unique ownership through copyrights or patents" (Lynch and Baines, 2004).

The importance of human resources as the main strategic asset of a university is further highlighted by focusing on the following paradigms about 'university culture' from various

regions and countries of the world: According to the Chinese perspective the ultimate objective of university education is the creation of the "new person who surpasses former generations and pushes human civilization forward" by pursuing brilliant traditions of university, people as its foundation, creation (educational) as main task, discipline, moral excellence, tenacity of purpose, high aiming ideals, seeking genuineness or truth, distinction of right from wrong, rectification of one's heart, cultivation of lofty personality, observation of standards or traditional spirit, virtue of the teaching staff, creation in the study and research of teachers and students alike and by creating a school spirit (Xu Jian Pei, 2002). Historically the Japanese universities have been undergraduate school oriented organizations (Ogawa, 2002) but inspite of that the core elements of importance are considered as teachers, their research orientation and their expertise. The core Nordic university values are considered to be inspired teaching, unique talent and researcher's integrity (Sondergaard, 2001).

The preceding paragraphs clearly depict the following attributes required for the universities to sustain and maintain their competitive advantage:

- Intellectual capital (human resources)
- Teaching staff (human resources)
- Research orientation of teachers (capability)
- Teachers' expertise/knowledge (capability)
- Unique talent of teachers (capability)

What follows from the above discussion is that it's the human assets and their capabilities and competencies which are recognized as the main source of competitive advantage for universities across the globe. Since competitive advantage conferred by assets and capabilities leads to performance, therefore, this paper suggests the following broad proposition:

"The performance of a university will be positively associated with its intellectual capital or human resources (teaching staff) and their capabilities".

Section Four

Application of RBV at the Three Schools of University of Management and Technology (UMT): Intellectual Capital and University Performance Data Analysis

UMT, a Lahore based university founded as Institute of Leadership and Management (ILM) in 1990, has three schools under its jurisdiction and following is a brief description of these schools.

1. School of Business & Economics (SBE), offers MBA Professional and Executive, BBA, B.Com, Masters' in Banking & Finance (MSBF), Bachelors' in IT (BBIT) and PhD in Management
2. School of Science & Technology (SST), offers Masters' in Computer Sciences (MCS), Bachelors' in Computer Sciences (BCS), and MS.
3. School of Social Sciences & Humanities (SSSH), offers Masters' in Education and English Language Teaching along with a PhD program

A total of about 2000 students are enrolled in these three schools (as per Fall 2006) with the following breakup as presented in Table 1:

Table 1:

School Name	Students Enrolled as a Percent of Total Students
SBE	55%
SST	37%
SSSH	8%

These three schools have their own full - time faculty and other organizational resources. Since this paper is only considering the impact of human resources (intellectual capital) on the performance of the respective school, the measuring instrument as shown in Table 2, attempts only to measure the capabilities and competencies of senior full - time faculty of the school.

Table 2:

Intellectual Capital Measuring Instrument
1. School:
2. With UMT since:
3. Designation:
4. Gender:
5. Number of years experience as university teacher:
6. Number of years experience in industry:
7. Number of consulting projects completed as consultant:
8. Highest level of education attained:
9. University where enrolled as a student:
10. Number of research papers written:
11. Number of research papers accepted for publication:
12. Journals where these papers are accepted or published:
13. Number of papers presented in conferences/seminars:
14. Where were these conferences/seminars held:
15. Did you sponsor yourself or did your organization sponsor you for conferences:
16. Number of teaching cases written:
17. Where were these cases published:
18. Number of projects conducted as corporate trainer:
19. Where were these projects conducted:
20. Number of MS/MPhil/Doctoral thesis/dissertations supervised:

The measuring instrument is now discussed in some detail.

The Intellectual Capital Measuring Instrument (ICMI) is developed as a result of literature review and discussions with senior faculty members of all the three schools of UMT. A total of 20 items are used to measure the Intellectual Capital (IC), the single independent variable of this study for each school of UMT.

The sample for this study included all senior faculty members of the schools. Senior faculty members, for the purpose of this study, are defined as those with a designation of Assistant Professor or above and who are with UMT for at least one year.

During literature review and discussions with the senior faculty members of the UMT schools, the following themes emerged around which the IC of the schools is measured:

1. Teaching Experience: defined in terms of total number of years' experience as university teacher (item#5).
2. Industrial Experience: the discussion with the senior faculty revealed that an important indicator of the effectiveness of a university teacher is considered to be his exposure to industry. This is because teachers having direct exposure to industry (not as consultants but as full time employees) equips them better to relate students' academic questions/queries with real life situations and hence they can prepare students more effectively to take up the challenges of future than those teachers who are not exposed to industry (item#6).
3. Consulting/Training Experience: consulting, training and teaching are interrelated processes and a multiple experience of consulting and training is considered an important attribute of the teaching skills of the faculty (item#7,18&19).
4. Research Orientation: the most crucial aspect of university teaching is the creation of unique knowledge and that largely stems from the research experience of the senior faculty (item#10,11,12,13,14,15,16,17&20).
5. Educational Background: of the faculty member was also pointed out to be an important indicator of a teacher's uniqueness and effectiveness for the university (item#8&9).

So far human resources (intellectual capital) have been identified as a main source of generating competitive advantage or performance of a university and teaching, industrial, consulting/training experience, research orientation and educational background of the IC captures the unique capabilities and competencies which the faculty has developed over the years.

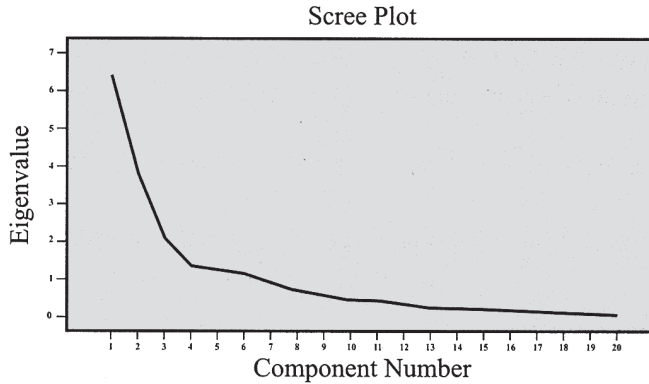
Factor analysis (principal components) was used to assess the dimensionality of the scale items and as Table 3 shows, 61.8% of the total variance is accounted for by three components:

Table 3:

Total Variance		
Component#	% of Variance Explained	Cummulative%
1	32.09	32.09
2	18.83	50.92
3	10.35	61.28

The following scree plot (Figure 1) also points towards a three factor solution:

Figure 1



Following is the component matrix showing extraction of 6 components.

Table 4

Component Matrix

	Component					
	1	2	3	4	5	6
School Category	.229	-.674	.224	.018	-.339	.230
Faculty Designation	.647	.272	.204	.419	-.314	-.166
No. of years with UMT	-.143	.061	.785	.078	-.147	.224
Gender	.057	.024	-.692	.498	.107	.000
No. of Years as University Teacher	.464	.476	.444	.005	-.166	-.270
No. of years Experience in Industry	-.582	.495	.053	.338	.198	-.236
No. of Consulting Projects Conducted	-.560	.531	-.053	.023	.039	-.368
Highest Level of Education	.820	-.166	-.168	.260	-.243	-.109
University enrolled in as student	.284	-.244	-.548	-.349	.109	-.094
No. of Research Papers Written	.831	.296	.220	-.101	.178	-.159
No. of Papers Accepted for Publication	.852	.212	.145	-.155	.205	-.269
Journals where Published	.795	.063	.084	-.051	.261	-.060
No. of Papers presented in Seminars/Conferences	.857	.203	-.016	.014	.215	.008
Where the Seminar/Conference was held?	.767	.361	-.187	-.002	.191	.386
Who Sponsored for Seminars/Conferences?	.674	.399	-.071	.096	-.016	.493
No. of Cases Written	-.236	.707	-.146	.229	-.107	.244
Were the Cases Published?	.068	.474	-.165	-.666	-.313	-.023
No. of Projects conducted as Corporate Trainer	-.353	.799	-.057	-.059	-.087	.021
Where were the Trainings conducted?	-.187	.729	-.202	-.142	-.301	.180
Thesis/Dissertation Supervised	-.509	.172	.380	-.067	.600	.275

Extraction Method: Principal Component Analysis.

6 components extracted.

The above Table and the loading scores isolate three factors or dimensions of the measuring instrument:

1. Research Orientation
2. Corporate Training
3. Teaching Experience

This factor solution is consistent with the underlying themes (teaching experience, industry/consulting/training exposure, research orientation and educational background) of the measuring instrument.

Reliability

The questionnaire shown in Table 2 is an outcome of the five themes identified in the face-to-face discussions with senior faculty members and the resulting questionnaire was pre tested with 3 deans of the three schools before finalizing. Another important factor adding to the reliability of the questionnaire is the fact that the responses to questions are not based on perceptions of the respondents instead they are actual and can be verified from records.

Validity

Convergent validity: The outcome of the face-to-face discussions with senior faculty and the above mentioned literature review present very similar themes/issues around which the human capital of a university is measured (reference to be made in the literature review from where these five themes are coming from). Therefore it can be said that the requirement for dissimilar methods is met to some extent.

Discriminant validity: This validity is tested following the method used by Kleinsorge and Koeing (1991). Among the scale items, the highest correlations are .949 between number of research papers written and number of research papers accepted, .611 between school category and number of years experience in industry and, .605 between faculty designation and number of years experience as university teacher. These correlations are no doubt high but the scales are quite different in content so it does not appear that the same issue is measured again and again.

Data Analysis for the IC of the three schools of UMT

All the interviews were conducted by the writer himself either face-to-face or on telephone. A total of 35 senior faculty members were interviewed from the three schools of UMT, following is a school-wise breakup of the respondents surveyed:

SBE	51.4%
SST	34.3%
SSSH	14.3%

The IC scores for each school of UMT, based on the information gained from the measuring instrument, is now calculated. Table 5 represents the summary of the results of cross

tabulation analysis.

Table 5

Cross Tabulation Analysis (All figures as % of total, in decimal forms)

Measuring Item	SBE	SST	SSSH
10 years + experience as university teacher	.371	.115	.029
7 years + industry experience	.315	.115	0
10 + consulting projects conducted	.229	.029	0
Education (post-grad, PhD or MPhil/MS)	.2	.286	.115
Research papers written	.287	.2	.058
Papers accepted for publication	.172	.172	.057
Journals where accepted (Pakistan+outside Pakistan+both)	.172	.172	.058
Papers presented in conferences	.257	.172	.086
Conference sponsored (self and both self & organization)	.114	.029	.057
Cases written	.258	.029	0
Cases published	.086	0	0
Corporate training conducted	.314	0	0
Thesis/Dissertations supervised	.143	.229	.057
Total IC Score	2.9 18	1.548	.517

Summation of the measuring items scores (as percent of total expressed in decimals) generates the IC score for the school. According to the above analysis of IC scores, the three schools of UMT show the following rankings:

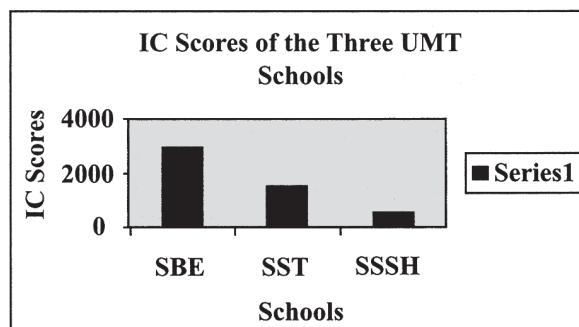
SBE 2.918 (Rank 1)

SST 1.548 (Rank 2)

SSSH .517 (Rank 3)

SBE has 1.88 and 5.6 times higher IC scores respectively as compared to SST and SSSH. SST has about 3 times higher IC score than SSSH. Figure 2 depicts this comparison in graphical form.

Figure 2



Since we now have the basis for IC measurement of each school of UMT, the next step in this study is to relate the level of IC formation with the performance of the schools.

School Performance

The definition of university performance for this paper is derived from an interpretation of quality adopted from the Baldrige 2004 Education Criteria for Performance Excellence (Table 3) modified for universities (Carr, Hamilton and Meade, 2005).

Table 6

Strategic planning
Student, stakeholder and market focus
Knowledge management
Education, training and development of academic staff
Quality systems
Teaching, learning and assessment
Research and postgraduate study
Community service
Support process

Adapted from Baldrige National Quality Programme 2004

Based on the Baldrige Education Criteria for Excellence and a study conducted to evaluate the performance of the University of Otago (Meade et al., 2005), the following performance indicators are used in assessing the performance of each school of UMT:

1. Improved Teaching Effectiveness is captured through number of student enrollments per year (student enrollment can be an indirect way of assessing students' feedback on the learning outcomes and teaching effectiveness) and the funds generated through enrollments. Other indicators include number of degree programs initiated and number of courses developed.
2. Teaching and Learning Grants are a representation of a university's ongoing commitment to performance/quality improvements.
3. External Consulting Income measures the capacity of the university to contribute to the development of the corporate sector.
4. Internal Research activities are measured through number of research papers/articles and teaching cases produced by the school.
5. Number of students placed (through the placement department of UMT) in the industry would indicate the coordination and impact a school makes on the corporate sector. This indicator is taken as a proxy for 'employability' criteria; one of the four criteria published by The Higher Education Funding Council for England (HEFCE), the other three being access and participation, retention and progression and research (Bratti, McKnight, Naylor and Smith, 2004).

Data Analysis

Based on the above criterion of a university performance, secondary data spanning the last 3 years (2002 to 2005) was collected from all the three schools of UMT, concerning the following indicators:

1. Student enrollment
2. Revenue generated through tuition fees
3. Number of degree programs initiated
4. Number of courses developed
5. Teaching/Learning grants issued to faculty
6. External consulting income
7. Number of research papers produced
8. Number of students placed in the industry

Table 7 summarizes the data collected.

Table 7

UMT Schools Performance Indicators (Year 2002 – 2005)

(All figures as % of total, in decimal forms)

Measuring Item	SBE	SST	SSSH
Student enrollment	.53	.38	.09
Tuition fee revenue	.65	.32	.03
Degree programs initiated	.47	.3	.23
Courses developed	.66	.21	.13
Teaching/learning grants	.72	.28	0
External consulting income	1	0	0
Research papers produced	.53	.47	0
Student placed in industry	.72	.28	0
Total Performance Score	5.28	2.24	0.48

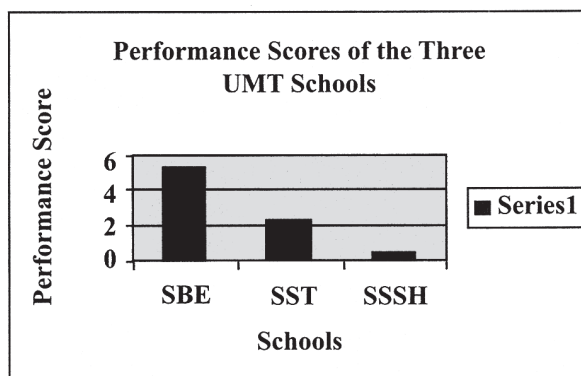
Summation of the measuring items scores (as percent of total expressed in decimals) generates the Performance score for the school. According to the above analysis of Performance scores, the three schools of UMT show the following rankings:

SBE 5.28 (Rank 1)

SST 2.24 (Rank 2)

SSSH 0.48 (Rank 3)

SBE has 2.35 and 11 times higher Performance Score respectively as compared to SST and SSSH. SST has about 4.67 times higher Performance Score than SSSH. Figure 3 depicts this comparison in graphical form.



DISCUSSION

A cursory comparison of figures 2 and 3 and the school rankings in terms of IC formation and school performance clearly indicates that SBE with the best IC score (2.918) is also placed as the most performing school and has the highest Performance Score (5.28). Similarly, SST is ranked 2 in both the IC score (1.548) and Performance score (2.24) while SSSH has the lowest IC score (0.512) and is also the lowest performing school with a Performance Score of only 0.48. One can, therefore, conclude that IC and performance of a school move in the same direction and are positively related with each other so that a high IC formation will yield high performance. It will be worth remembering here that the IC score is a reflection of the unique, inimitable, non transferable and non substitutable capabilities and competencies of the senior faculty members of each school. The school with more of these capabilities and competencies embedded in its faculty, SBE in this study, has performed better over the years as compared to the two other schools.

The data collected from Table 2 measuring items (IC measuring items) was subjected to One Way ANOVA to assess the differences across three school categories in terms of the other variables measured. Results are shown in Table 8.

Table 8
ANOVA

		Sum of Squares	DF	Mean Square	F	Sig.
No. of years with UMT	Between Groups	3.727	2	1.863	1.405	.260
	Within Groups	42.444	32	1.326		
	Total	46.171	34			
No. of Years as University Teacher	Between Groups	5.077	2	2.538	.729	.490
	Within Groups	111.494	32	3.484		
	Total	116.571	34			
No. of years Experience in Industry	Between Groups	57.877	2	28.938	8.217	.001
	Within Groups	112.694	32	3.522		
	Total	170.571	34			

No. of Consulting Projects Conducted	Between Groups	14.822	2	7.411	4.493	.019
	Within Groups	52.778	32	1.649		
	Total	67.600	34			
Highest Level of Education	Between Groups	3.015	2	1.508	2.350	.112
	Within Groups	20.528	32	.641		
	Total	23.543	34			
University enrolled in as student	Between Groups	2.965	2	1.483	1.785	.184
	Within Groups	26.578	32	.831		
	Total	29.543	34			
No. of Research Papers Written	Between Groups	4.169	2	2.085	.900	.417
	Within Groups	74.117	32	2.316		
	Total	78.286	34			
No. of Papers Accepted for Publication	Between Groups	5.015	2	2.508	1.060	.358
	Within Groups	75.728	32	2.366		
	Total	80.743	34			
Journals where Published	Between Groups	.958	2	.479	.338	.716
	Within Groups	45.328	32	1.416		
	Total	46.286	34			
No. of Papers presented in Seminars/Conferences	Between Groups	1.165	2	.583	.392	.679
	Within Groups	47.578	32	1.487		
	Total	48.743	34			
Where the Seminar/Conference was held?	Between Groups	1.994	2	.997	.580	.566
	Within Groups	54.978	32	1.718		
	Total	56.971	34			
Who Sponsored for Seminars/Conferences?	Between Groups	.283	2	.142	.114	.892
	Within Groups	39.717	32	1.241		
	Total	40.000	34			
No. of Cases Written	Between Groups	6.048	2	3.024	4.264	.023
	Within Groups	22.694	32	.709		
	Total	28.743	34			
Were the Cases Published?	Between Groups	.243	2	.121	1.554	.277
	Within Groups	2.500	32	.078		
	Total	2.743	34			
No. of Projects conducted as Corporate Trainer	Between Groups	49.706	2	24.853	7.744	.002
	Within Groups	102.694	32	3.209		
	Total	152.400	34			
Where were the Trainings conducted?	Between Groups	7.269	2	3.635	3.284	.050
	Within Groups	35.417	32	1.107		
	Total	42.686	34			
Thesis/Dissertation Supervised	Between Groups	2.265	2	1.133	4.275	.023
	Within Groups	8.478	32	.265		
	Total	10.743	34			

Assessing the link between Intellectual Capital Formation and Performance of a University

These results show that a statistically significant difference exists among the three UMT school categories on

- Number of years experience in industry $F(2,32) = 8.217, p = .001$
- Consulting projects conducted $F(2,32) = 4.493, p = .019$
- Cases written $F(2,32) = 4.264, p = .023$
- Projects conducted as corporate trainer $F(2,32) = 7.744, p = .002$ and
- Student dissertations/thesis supervised $F(2,32) = 4.275, p = .027$

The post hoc Tukey comparisons were conducted to determine the source of differences and the results are shown in the following Tables 9 to 13.

Table 9:

No. of years Experience in Industry

Tukey HSD

School Category	N	Subset for alpha = .05	
		1	2
SSSH	5	.00	
SST	12	1.75	1.75
SBE	18		3.56
Sig.		.138	.123

Table 10:

No. of Consulting Projects Conducted

Tukey HSD

School Category	N	Subset for alpha = .05	
		1	2
SSSH	5	.00	
SST	12	.83	.83
SBE	18		1.78
Sig.		.371	.283

Table 11:

No. of Cases Written

Tukey HSD

School Category	N	Subset for alpha = .05	
		1	2
SSSH	5	.00	
SST	12	.08	
SBE	18	.89	
Sig.		.083	

Table 12:

No. of Projects conducted as Corporate Trainer

Tukey HSD

School Category	N	Subset for alpha = .05	
		1	2
SSSH	5	.00	
SST	12	.25	
SBE	18		2.56
Sig.		.954	1.000

Table 13:

Thesis/Dissertation Supervised

Tukey HSD

School Category	N	Subset for alpha = .05	
		1	
SST	12	1.17	
SSSH	5	1.60	
SBE	18	1.72	
Sig.		.075	

Means for groups in homogeneous subsets are displayed.

a Uses Harmonic Mean Sample Size = 8.852.

b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The Tukey HSD Tests show that the

- Mean number of years experience in industry is 1.75 for SST and 3.56 for SBE
- Mean number of consulting projects conducted is 0.83 for SST and 1.78 for SBE
- Mean number of cases written is 0.08 for SST and 0.89 for SBE
- Mean number of projects conducted as corporate trainer is 0.25 for SST and 2.56 for SBE
- Mean number dissertations/thesis supervised is 1.17 for SST, 1.6 for SSSH and 1.72 for SBE

These post hoc Tukey HSD tests indicate that the three schools differ significantly in terms of industrial experience, consulting and training experience, case writing and students' dissertations supervised (p value less than .05).

Section Five

Limitations of the Study

This study does not test the relationship between IC formation and school performance on the basis of regression analysis. The main impediment in this regard was the difference in the level of analysis; IC formation was measured through summing the individualized responses from the senior faculty but in case of the performance data, the responses were aggregates of the

different performance criterion as mentioned earlier, and therefore, direct statistical testing between the two was not possible using the SPSS version 12. The study therefore is non conclusive when it comes to determining the causality of the association between IC and school performance. But the study definitely provokes some food for thought for future research in this area.

Future Research Implications

Following are some of the implications of this study which need to be addressed from a futuristic research point of view:

1. There is a need for developing reliable and valid instruments to measure IC formation and Performance of a university.
2. The study needs to be replicated across other educational institutions, both public and private and national and international, so that the link between human capital formation and educational institutions' become more vivid and transparent.
3. Longitudinal studies exploring the link between human capital and performance would shed more light on the causal relationship between these two variables.

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