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Big Data Analytics and its Reflections on DIKW Hierarchy

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Abstract

This Paper revisits the classical DIKW hierarchy of knowledge management in the context of emerging discipline of big data analytics. It observes that the already fragile conceptual boundaries between information and knowledge have been almost totally demolished with the advent of big data analytics. The ability to analyze vast volume, variety and velocity of the entire population of data in real time and to generate value and actionable information based on the same has rendered the intermittent steps of data being processed into information and information being further processed into actionable information as redundant. In the new scheme of things, data itself becomes a key resource for an enterprise, and deliberate opportunities are created to generate data at innumerable data points to create value, thereby providing competitive advantage to an enterprise.

Keywords: Data, Information, Knowledge, Wisdom, DIKW Hierarchy, Analytics, Datafication, Prediction, Predictive Modeling.

Introduction

One of the key theoretical frameworks in the field of knowledge management (KM) is the hierarchy of Data, Information, Knowledge and Wisdom (the DIKW hierarchy). This hierarchy has an important conceptual contribution to make to KM discipline since it attempts to clarify semantics and provides a source of understanding of the term knowledge, which is sought to be 'managed' by using KM. The hierarchy has origins in the IT domain wherein understanding the distinction between data and information is a prerequisite to the discipline of information system design. It is widely accepted that data represents isolated facts without any context being highlighted and information is processed data. By processing data and examining it in a specific context, it gets endowed with meaning. Information in contrast to data, being processed and having been endowed with a purpose, reduces uncertainty, increases negentropy and helps bring in certain orderliness to a situation. Specially designed management information systems, executive information systems and decision support systems etc. provide the requisite information to various levels of management and support them in decision making. The managerial levels of decision making in an organization may include strategic, tactical or operational levels and the types of decisions which are made may include structured, semi-structured or

unstructured. Thus information has an important role to play in managerial decision making (Laudon & Laudon, 2013).

The data itself, which is the input to a data processing system (the output of which is information), is typically generated through transaction processing systems. It can be argued that data is a by-product of transaction processing. Whenever a decision is made and it is acted upon, it leads to a transaction or a series of transactions taking place. The secondary outcome of any completed transaction is generation of data. Depending upon the nature of transaction processing system (whether on-line and real time or off-line) information as the output also gets updated, and this cyclic process continues.

Knowledge, the next entity in the DIKW hierarchy, has been defined as 'actionable information' (Tiwana, 2002). The fact that it is placed above information in the hierarchy implies that it has greater 'value' to an organization and its managers than information alone. The key difference which is highlighted in the KM literature is that knowledge triggers action. This assertion however is also a source of ambiguity since information is also expected to support decision making and thus lead to action. Thus, considerable subjectivity comes into play for an observer to conclude whether a particular entity can be termed information or knowledge; more so because what may be knowledge from the point of view of a person with certain objective and context in mind, the same entity may actually be regarded as sheer data or information by another person with a different objective and context in mind.

Wisdom, the next entity in the DIKW hierarchy, has also been variously defined. One typical definition of wisdom is that "it is cumulative knowledge tempered by experience". One obvious connotation is that the time dimension for wisdom is comparatively much longer than that of knowledge. Only a long term view of the results of actions taken based on decisions made by the managers of the organization can provide the necessary accumulation of knowledge and the experience to validate the effectiveness or otherwise of decisions made and actions taken. In fact, the time dimension applies even to the comparison between knowledge and information and between information and data. It can be argued that knowledge is more durable than information, which perishes (or loses its value) once decisions based on that information have been made. For instance, if all relevant information about various flights available between two cities (which an executive wishes to travel) has been provided to the executive and based on that information and other information about his meeting schedules in the city to be visited, the executive has decided the flight to be taken and has actually travelled on that flight, the information about his itinerary has lived its utility. It can simply be stored for future reference, and in that sense becomes data. However, knowledge doesn't perish soon. The knowledge about airlines operating between two cities and their schedules and fares has a longer term utility, though this also gets obsolete over time and needs to be updated.

An interesting aspect about data is that is not perishable at all! Active data is typically stored in structured databases which follow a certain specified architecture, and which is processed to generate information. Organizations typically maintain historical data as long as physical storage or electronic storage constraints make it unviable to maintain historical data. Enterprises invest in data warehousing and data mining. Typical data mining tools are

often used by the enterprises to analyse historical data, identify trends and patterns if any and use the insights gained from these methods to carry out customer segmentation and work out differentiated marketing strategies. Thus, Knowledge Discovery through Data Mining (KDD) becomes another approach available to enterprises and their managers to generate knowledge which helps decision making.

If we move beyond the IT perspective of KM towards HR and strategic perspectives of KM, the understanding of the term knowledge gets considerably enlarged and even divorced from the DIKW hierarchy. The sub-categorization of knowledge into terms such as Know-what, Know-how, Know-who and Know-why provide different connotations of knowledge from that arrived at using DIKW hierarchy. Knowledge is also viewed as part of the competence set of an individual in an enterprise along with skills and attitudes (the typical trilogy of KSA or Knowledge, Skills and Attitudes) by HR practioners. Another school of thought views knowledge as a strategic resource for an enterprise in addition to the traditional resources of land, labour and capital. This is a very broad perspective of knowledge which is linked with several micro- and macro-level concepts such as capacity of an enterprise for action, intellectual capital, intangible capital, knowledge economy and knowledge based development.

In the recent years, “Big Data” and “Big Data Analytics” have emerged as new fields of action which have become very popular globally, thanks to the ability provided by these fields to analyze the entire population of data on any subject matter or phenomenon in real time by developing and using machine-to-machine algorithms for predictive modelling and to arrive at decisions based on such models. The applications of these emerging fields are considered quite novel and revolutionary as can be seen from the flood of new literature that has been witnessed in the last few years. An important observation from the recently emerging literature on big data analytics in that the DIKW hierarchy appears to be totally demolished. The raw data itself becomes the prime mover of action and enterprises take pride in being designated as data-driven (and not necessarily knowledge-driven). Data is being viewed as the new resource or the new fuel which is driving the enterprises and the economy. Datafication, the art and science of continually creating new data at multiple data points without necessarily being related to completion of transactions, has become a new imperative for enterprises to apply the methods of big data analytics and create value from the same. Thus data has become the new focus of attention and the conventional approach to view it as the lowest rug of the DIKW hierarchy to be meticulously followed, is being increasingly challenged. This paper explores this new trend and the new conceptual relationships that appear to be developing.

Big Data

McKinsey (2011) defines “Big Data” as datasets whose size is beyond the ability of typical database software tools to capture, store, manage and analyze data. This definition obscures the fact that the size of big data is indeed very large, ranging from “a few dozen terabytes to thousands of terabytes”. In a modern day enterprise, an extraordinarily large volume of data about customers, suppliers and operations gets generated each day as ‘an exhaust or by-product’ of innumerable activities happening in their sphere of operations. Data is also being almost incessantly generated from mobile phones, networked server modes in automobiles and industrial machines etc. Social media sites such as Facebook,

Twitter, YouTube and LinkedIn are like perpetually running large data generation machines, adding to the existing data storage at a high speed. The newly emerging technology of Internet of Things (IOT) is connecting a variety of IP-identifiable devices or things with each other and with the human beings and leading to a large volume, variety and velocity of machine-to-machine communications and generating more and more data. Thus "a torrent of data is flowing into the global economy every day". The characteristics of the term big data as stated above are fundamentally different from that of the data as understood in the traditional DIKW hierarchy and conventional database management systems. There are at least three characteristics, namely, volume, velocity and variety of data which distinguish big data from the traditional understanding of data. A fourth V namely 'Value' has also emerged which can be considered as an integrating factor of big data (Lycet, 2013).

Associated with the incessant creation of big data is the development of analytics to process this data and enable managers and enterprises to carry out predictive modelling and develop algorithms which help them in a revolutionary manner in making strategic decisions in real time. A key point about Big Data analytics is that it aims at finding patterns from the accumulated historical data and deriving insights from the same to guide future actions. A classical example of big data analytics documented by Mayor-Schonberger is the prediction by Google of the spread of H1N1 virus flu in specific regions of US, based on analysis of three billion search queries per day for 50 million most common search items related to flu. This analysis was used to develop a large number of mathematical models and to identify a narrow set of models which were then used for real time prediction (Mayor-Schonberger, 2013).

An essential feature of big data analytics is that the entire data population (and not a sample of it) is required to be analyzed, and the size of such data set may be in multiple petabytes. Secondly, in big data analytics, exactness of data is not critical; a sense of general direction is more important than accuracy. Thirdly, big data analytics does not aim at discovering causality; it aims at discovering patterns and correlations in data. Accordingly, there is a focus on arriving at the most likely probability for a prediction to turn out true rather than on predicting deterministically or with certainty (Mayor-Schonberger, 2013). (To be sure, prediction with certainty is a myth!)

Big data analytics is considered as a key source of creating value for an enterprise today. McKinsey (2011) has enumerated five ways in which big data creates value. These are:

a) Creating transparency
b) Enabling experimentation to discover needs, expose variability and improve performance
c) Segmenting population to customize actions
d) Replacing human decision making with automated algorithms
e) Innovating new business models and enhancing productivity

These ways are being facilitated by new technological developments related to storage and analysis of big data and include the technologies of storage, computing and analytical software, etc. (McKinsey, 2011)

The newly developed ability and tools for big data analysis have led the decision makers in an enterprise to shift their focus from knowledge back to "data". In lieu of knowledge, it is "data" that is now being given a prime place of importance. It is being proclaimed as the "new raw material for businesses" and "the oil of the new economy" (Mayor-Schonberger, 2013). Organizations and individuals take pride in being called data-driven. Decision making is no longer a function of applying a given set of hypotheses generated through a careful understanding of the interdependence of various factors, but increasingly a function of predictive modeling, a technology that learns from data (experience) to predict the future behaviour of individuals in order to drive better decisions. The predictive models that predict the future behaviour of a customer segment or any other target group are essentially based on correlation analysis among various variables as identified by sifting through the entire data population. Thus, the entire data set processed by machine learning in real time yield predictions which guide decision making. Each predictive analysis application comprises of what is predicted (kind of behaviour to predict for each individual – action, event or happening), what is done about it: decisions driven by predictions; and actions taken in response to predictions (Siegel, 2013).

Big data and big data analytics is often differentiated from the traditional data mining tools used for analytical purposes. For example, OLAP (On-line Analytical Processing) is an established data processing system for identifying patterns in data through on-line analytical applications. However, what distinguishes big data analytics from OLAP is that it refers to analysis one can do at large scale, that can't be done at a small scale. Analogy is given to the technique of movie making from still images. Just as too many images seen at fast pace (24 frames per second) make it a movie (which has new emergent properties than a sequence of still images), in the same way, too much data analyzed fast gives new insights. Analogy is also given to Nano-technology (in reverse). Just as Nano-particles by virtue of their being infinitely small have certain emergent properties, in the same manner, big data, by virtue of being almost infinitely bigger than traditional data, its analytics gives certain emergent insights which are not possible in the traditional analytics. However, because of data's vast size, decisions are made by machines and not by humans (though humans as always have the authority to override machine-made decisions) (Mayor-Schonberger, 2013).

Datafication

Another emerging concept associated with big data is "Datafication". Datafication of a phenomenon refers to the process of putting that phenomenon into a quantified format for tabulation and analysis. Such a 'quantification enables prediction and planning" (Mayor-Schonberger, 2013). According to Lycet (2013), "datafication is an IT-driven sense making process". It comprises of three inter-related concepts, namely, dematerialization, liquefaction and density. Dematerialization refers to the ability to separate the information (or data) aspects of an asset and its use. Liquefaction refers to manipulation and movement of data for reuse for different purposes. Lastly, density refers to recombination of resources mobilized for a particular context. A typical example of datafication is recording the location of an individual having a cell phone, an activity which continually takes place. Also considered datafication is the recording of instances when a person may connect with an e-commerce website and recording of all the activities in which that person indulges at the website, including viewing and clicking an ad, initiating a buy transaction and either completing it or dropping it in between. Datafication also takes place when a cell device

records calorie intake, blood pressure or several other parameters related to an individual's health. The activities of individuals on social networking websites such as Facebook, Blogs and Twitter also can be and are being datafied. The process of datafication provides opportunities for data correlation and developing predictive models based on such correlations. Techniques such as sentiment analysis help datafy the moods of individuals and correlate these with their likely shopping behaviour and impact on other economic activities. Thus, one finds ever-growing datafication of diverse intangible terms such as relationships, experiences and moods (Siegel, 2013). An interesting aspect is that unlike the classical conceptualization of data being the by-product of a completed transaction, datafication generates data irrespective of whether a transaction is completed or not. Systems are designed such that all the people's actions and movements in the world generate data. For example, a person browsing on a website becomes the source for generating endless data on where he clicked, how long he looked at a page and what did he type etc., providing seamless opportunities to derive 'digital insights' from this vast array of data. The era of IoT is expected to give a huge fillip to datafication because it is technologically easy to capture, create and correlate large volumes of data about human activity at brief intervals from various interconnected devices and use the insights gained to create new uses and new value.

Specific reference to the increasing trend towards datafication of HR has been given in a recent paper by Deloitte. The author observes that 'datafication is a new way of doing things' and 'just as electricity changed the way we manufacture and deliver products, so can data change the way we think about managing people'. This is happening owing to three major trends namely 'more data', 'more tools' and 'more techniques'. The datafication of HR is a part of a broader trend affecting other business functions as well. Bersin (2013) defines datafication as "taking an existing business and turning it into a data business". As examples of datafication, one can see that (a) Facebook has datafied the friends' networks; (b) Google has datafied search and information retrieval behaviour and (c) Twitter has datafied news and real time information.

Big Data Analytics and DIKW hierarchy

An interesting inference from the above overview of big data analytics is that actionable information to guide decision making gets generated through real time analysis of all the existing data using automated algorithms. This not only has the potential to replace (or to support) human decision making, but it also relieves the decision maker from trying to search for causality. The predictive models developed using big data analytics have the power to predict a wide variety of decisions such as whether and when one will get a heart attack, or one will default on loan repayment or one will commit a crime. However, all such predictions are based on finding patterns and correlations in different data streams (Siegel, 2013). Thus, the distinction between information and knowledge as derived from data becomes irrelevant. The predictive models and the results derived from them become the information and/or knowledge generated, and the computed probabilistic indices through big data application themselves become a proxy for actionable information, or knowledge as understood in the DIKW hierarchy.

In a sense, the new paradigm of DIKW hierarchy appears to be a jumpstart from data to action, ignoring the intermittent steps of information and knowledge and making irrelevant

the already fuzzy distinction between information and knowledge. As inferred by Mayor-Schonberger (2013), 'big data analysis replaces highly skilled… specialists of the past', who were engaged in creating knowledge based on carefully designed sampling approach and using that knowledge to support decision making. Big data analysis also leads to an understanding of "know-what" and not "know-why" (the two forms of knowledge in addition to know-how and know-who), implying that it does not aim at shedding light on the inner working of a phenomenon.

In a classical paper of the nineties (World Bank, 1999), it was argued that "as compared to other commodities or resources, knowledge is non-rivalorous.". This implied that sharing of knowledge by a person possessing that knowledge with another doesn't mean that the knowledge has been given away and no longer belongs to the first person. What was true for knowledge in that era is now true for data in the big data era. Today, data has become non-rivalorous. Its value doesn't diminish when it is used; it is processed again and again for different uses. While data may be collected for a particular use or even collected passively, it gets used for other purposes. In the example of mobile phone operators collecting data on subscriber locations for the purpose of call routing, it can be seen that the same data can be reused for location-based ads and promotions in a continual manner, not only for that individual, but also in aggregate (Mayor-Schonberger, 2013).

The Anatomy of DIKW Hierarchy Revisited

The traditional DIKW hierarchy can be dissected to reveal its anatomy and in light of the material presented above, its validity can be revisited. Tuomi (1999) summarized a few classical definitions and interpretations of data, information, knowledge and wisdom, which are being summarized in a tabular form at Table 1. Based on these, he argued the following:

> Underlying all these models of knowledge as a 'higher form of information', is the idea that knowledge has to be extracted from its raw materials, and in the process meaning has to be added to them… The underlying conception also assumes sequentially, a process model where something simple is converted into something more complex and valuable… The common idea is that data is something less then information, and information is less than knowledge… First we need to have data before information is created and only when we have information, knowledge can emerge.

This anatomy needs to be now revisited in the context of big data analytics. However, even before that, a few conceptual papers have reflected upon this anatomy.

Further Reflections on the traditional hierarchy

Literature cites at least two views which comment upon the DIKW hierarchy and either extend it further or suggest its reversal giving their own arguments in support of their positions. These are (a) Laszlo's Pyramid of Meaning and (b) Tuomi's Reversed Knowledge Hierarchy. A brief description of each these is given below.

Laszlo's Pyramid of Meaning

Laszlo has given another perspective to DIKW hierarchy. In his Paradigm of Meaning (Laszlo, 1994), the DIKW hierarchy is annotated with a vertical scale running from "deterministic

objectivity" to "possibilistic subjectivity". Deterministic objectivity implies that answers to basic questions at that level can be conclusively provided by any one in an objective manner. The highest deterministic objectivity exists at the level of data which is nothing but raw facts which are undisputed and unquestionable. Possibilistic subjectivity is at the other end of this vertical continuum where the questions posed may have multiple (and sometimes even contradictory) answers since the answers depend upon the context and the frame of reference of the person trying to answer the questions. It is apparent that at the extreme top of the hierarchy, the degree of subjectivity is many times higher than at the lower levels.

This enlarged DIKW hierarchy proposed by Laszlo and designated as "the pyramid of meaning' begins with data and moves up to information, from information to knowledge, from knowledge to comprehension, from comprehension to understanding, from understanding to wisdom and finally from wisdom to enlightenment. Further elaboration of this pyramid can be seen below:

Data refers to the facts or elements existing in random manner without any specific context. Information then works on the data or the raw facts and is descriptive in nature. It arrives at meaning from data and describes that meaning without necessarily any action being visualized out o it. Information answers the basic questions of a particular context related to issues such as who, what, when, where and how many etc. It is apparent that information has been arrived at by processing the data with a view to distil out meaning and thereby add some incremental value to raw data. The next level of the pyramid leads to what is termed as "knowledge" which is instructive in nature. Knowledge answers further advanced questions such as how, how to and why. The author of the pyramid of meaning does not attribute "actionableness" as one of the key characteristics of knowledge. However, the superiority of knowledge over information in guiding action is clearly seen from the quality of questions that get answered by knowledge, which don't get answered by information. Information no doubt reduces uncertainty by processing data; however, it doesn't per se trigger decisions. Knowledge on the other hand is more proactive since the questions which get answered suggest one or several courses of action. However, the subjectivity at this level is higher than at the level of information since the frame of reference of the decision maker guides the kind of questions to which answers are sought and choice of action once the answers to various questions start becoming available.

The next two elements added by Laszlo in the pyramid of meaning are "Comprehension" and "Understanding". These two have been interspersed between "Knowledge" and "Wisdom". Comprehension is described as explanatory since it answers several "Why" type questions.This can also be equated to the "Know-Why" type of knowledge and is in some senses a base for innovation and thereby creation of new knowledge. For that to happen, however, comprehension must lead to "understanding", a term with more enlarged meaning than mere comprehension. Understanding has been described by Laszlo as "being generative" as it gives rise to creative insights and requires intuition.

Table 1
Distinction between various components of DIKW Hierarchy*

S No.	Source	Data	Information	Knowledge
1	Spek & Spijkervet, 1997	Symbols which have not yet been interpreted	Data with meaning	Enables people to assign meaning and thereby generate information
2	Davenport, 1997	Simple observations of the states of the world	Data endowed with relevance and purpose	Valuable information
3	Svieby, 1997		Meaningless	Meaningful information when it is interpreted
4	Wiig, 1993		Facts and data that are organized to describe a particular situation or condition	Truths and beliefs, perspectives and concepts, judgments and expectations, methodologies and know-how
5	Nonaka and Takeuchi, 1995		Flow of meaningful messages to start with	Becomes knowledge when commitment and belief is created as a result of these messages
6	Davenport & Prusak, 1998	A set of discrete, objective facts about events… describe only a part of what happened; provide no judgment or interpretation	Data given meaning becomes information	Refined information in which human cognition has added value; knowledge contains judgments; values and beliefs are integral to knowledge
7	Tuomi, 1999	Unfiltered simple isolated facts	Patterns identified by putting facts into a context and combining them with a structure	Predictability discovered; information given meaning by interpreting it

- No significant attributes of wisdom were cited in the referred paper

Laszlo places wisdom as the next higher level in the hierarchy of the pyramid of meaning. It has been described as being evaluative. Wisdom requires empathy and is normative. However, wisdom is not the final entity in this hierarchy. Wisdom transforms to "enlightenment", which according to Laszlo is transcendent and which reaches new planes of consciousness.

Tuomi's Reversed Knowledge Hierarchy

Tuomi (1999) questions the traditional view of DIKW hierarchy, namely that data is a perquisite for information and information is a pre-requisite for knowledge. On the other hand, he stipulates that "data emerges only after we have information" and "information emerges only after we have knowledge". The author begins with his interpretation of the traditional thought process behind the DIKW hierarchy, according to which knowledge is a higher form of information and that there is a sequentially between data, information and knowledge. He further elaborates his interpretation of this process as follows:

> Data are assumed to be simple isolated facts. When such facts are put in a context and combined within a structure, information emerges. When information is given meaning by interpreting it, information becomes knowledge…. As the human mind uses this knowledge to choose between alternatives, behaviour becomes intelligent…. Finally, when values and commitments guide intelligent behaviour, behaviour may be said to be based on wisdom.

Soon, however, the author begins questioning the basic assumption about this sequentially. According to him:

> If… the object of…knowledge is an external reality…, then first we need to observe some simple facts before we can create knowledge… however, … even this most elementary perception is already influenced by potential uses, expectations, contexts and theoretical constructs.

Quoting several authors and philosophers of knowledge, he puts forth following arguments:

a) A human cognition can't see simple facts without these facts being part of its current meaning structure… and much of this meaning structure is unarticulated background against which articulation and explication happens
b) There are no isolated pieces of simple facts unless someone has created them using knowledge.
c) Data can emerge only if a meaning structure is first fixed and then used to represent information
d) Thus data is created from information by putting information into a predefined data structure, and emerges as a result of adding value to information
e) Information is a product created from knowledge.

Thus the overall line of his conceptual argument is that information is created only after there is knowledge and data emerges as a by-product of cognitive artefacts. In a sense, he strongly argues for the reversal of DIKW hierarchy.

DIKW Hierarchy in the light of Big Data Analytics

The available literature on big data analytics is highly application and practioners oriented and does not significantly dwell into conceptual or semantic differences between data, information, knowledge and wisdom. This is understandable given that this is a nascent field and not grounded in philosophical or conceptual foundations. One can argue that even the discipline of KM evolved out of practice and the conceptual frameworks of KM were subsequently weaved around the terminologies prevalent in the literature of Information Systems Design and Organizational Learning. However, a few observations are noteworthy:

a) Big data analytics stresses upon data being the key resource for an enterprise (in contrast to knowledge regarded as a key resource in the KM era)
b) Big data analytics aims at creating value directly from data which leads to action
c) The literature on big data doesn't make a fine distinction between data and information. In fact, it uses the term information interchangeably with data.
d) The big data literature considers data as non-rivalourus, a characteristic traditionally associated with knowledge
e) The thrust of algorithms developed using big data analytics is on finding correlations and not cause effect relationships.
f) Unlike traditional thought that data was created as a by-product of a transaction processing system, the big data analytics discipline banks upon creation of large volumes, variety and velocity of data. It buttresses the belief that 'more the data, more is the value which can be generated from it". Consequently, all data which gets created as a result of all the actions and movements of people in the world have the potential to create value.
g) Owing to huge data volumes being processed, predictive models and decision emerging therefrom are based on machine learning. A sub-set of the entire data serves as a test data and the learnings drawn from it are then applied on the remaining data.
h) Big data analytics does not preclude use of human judgment to take the final call on whether a specific action should be taken or not in the light of prediction that appear to highlight certain desired course of action. In fact, authors such as Siegel (2013) and Mayor-Schonberger (2013) have devoted considerable attention on whether it would be ethical to take certain actions based on actions which one would take based on the predicted outcome of a situation.
i) Both the authors refer to the data tyranny or data dictatorship which might ensue if the actions emerging from big data analysis are blindly pursued. Mayor-Schonberger particularly debaters the role of free will versus dictatorship of data, particularly with regard to making pre-emptive decisions based on predictions arrived at from big data analytics.
j) The privacy issues related to big data have also been highlighted by most authors. Though, privacy issues have always been associated with information systems discipline and concerns about it have been expressed in the past too, these issues have emerged as highly sensitive issues with the advent of big data analytics.
k) Datafication and the urge to generate as much data as possible in order to harness value from it and the resultant tendency for commercialization of data gathering and its sale to other parties have become major areas of concern at present.

Thus, big data analytics has implications not only for the theoretical or conceptual aspects such as DIKW hierarchy, it also has social and ethical implications which were probably lying dormant in the earlier periods.

Conclusion

This paper tries to bridge the gap between traditional conceptual literature differentiating between data, knowledge, information and wisdom and the new discipline of big data analytics which has opened the need to re-examine this differentiation in a conceptual manner. Obviously the last word has not been said about this important topic. It may be opt to quote Mayor-Schonberger (2013) again in this regard:

> Data is so widely available and so strategically important that the scarce thing is the knowledge to extract wisdom from it

The choice of words by him was apparently not deliberate, and definitely not with an intention to distinguish between data, information, knowledge and wisdom. However, inadvertently it rekindles that discussion and the need to critically look at the DIKW hierarchy once again.

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Efficiency of Working Capital Management and Profitability: A Case of Hindalco

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Abstract

The present research focused on the analysis of working capital management of Hindalco and its impact on the profitability. The findings of the study suggest that the company maintains more current assets throughout the period than the minimum norm. During the last ten years, the share of current assets to total assets is varying from 40 per cent to 83 per cent. This indicates the liquidity position of the firm over profitability objective. Other findings revealed that the firm invests maximum capital in inventories and receivables. The working capital margin data suggests that the company utilized more than half of its working capital requirement from long term sources. This over dependency on long term funds for working capital purpose may be detrimental to company's success in future. Hindalco is a key player in the Indian aluminum industry. In most of the cases, the performance of Hindalco in working capital management is better than the industry standard.

Keywords: Working Capital, Profitability, Indian Aluminium Industry

Introduction

Working capital management is one of the most critical aspects in any business operations. Working capital management involves the operating cycle that convers and rotate various components of the working capital for operational purpose. Initially 'cash' is converted into raw materials and subsequently, the raw materials get converted into work in process and then into finished goods. This is how various components of current assets keep on changing their forms due to value addition. As a result, they rotate and business operations continue. While managing the working capital, two characteristics of current assets should be kept in mind viz. (i) short life span, and (ii) swift transformation into other form of current asset. Each constituent of current asset has comparatively very short life span. Investment remains in a particular form of current asset for a short period. The life span of current assets depends upon the time required in the activities of procurement; production, sales and collection and degree of synchronization among them. A very short life span of current assets results into swift transformation into other form of current assets for a running business. If the manufacturing cycle involves a longer period, the need for working capital would be more. At times, business needs to estimate the requirement of working

capital in advance for proper control and management. The correct assessment of the working capital requirement is possible if the duration at various stages of the working capital cycle is estimated correctly. Thereafter, proper value is assigned to the respective current assets, depending on its level of completion.

The analysis of working capital provides a base to judge whether the practice prevailing in managing working capital is good enough or an improvement is necessary. Company management spends adequate time to make a trade-off between profitability and solvency. This ensures a minimum of cost of fund and with proper credibility in the market place.

Literature Review

A firm can exist and survive without making profit but cannot survive without working capital. Thus, working capital management is important because of its effect on the firm's profitability and risk and consequently its value (Smith, 1980). Maintaining high inventory levels reduces the cost of possible interruption in the production process or loss of business due to the scarcity of products, reduces supply costs and protects against price fluctuations among other advantages (Blinder and Manccini, 1991). Granting trade credit favors the firms sales in various ways. Trade credit can act as an effective price cut (Brennan et al., 1988; and Petersen and Rajan, 1997) and an incentive to customers to acquire merchandise at times of low demand (Emery, 1987). However, firms that invest heavily in inventory and account receivable can suffer low profit. Thus, greater the investment in current assets, lower is the risk, and profitability obtained. Similarly, trade credit is a spontaneous source of financing that reduces the amount required to finance the sums tied up in the inventory and account receivables.

Although working capital is the concern of all firms, it is the small firms that should address this issue more seriously. Given their vulnerability to a fluctuation in the level of working capital, they cannot afford to starve of cash. The study undertaken by Peel et al., 2000, revealed that small firms tend to have a relatively high proportion of current assets, less liquidity, exhibit volatile cash flows, and a high reliance on short-term debt. The work of Howorth and Westhead (2003), suggest that small companies tend to focus on some areas of working capital management where they can expect to improve marginal returns.

The study conducted by De Chazal Du Mee (1998) revealed that 60% enterprises suffer from cash flow problems. Therefore working capital management is very crucial for the long term survival of business. Narasimhan and Murty (2001) stress on the need for many industries to improve their return on capital employed (ROCE) by focusing on some critical areas such as cost containment, reducing investment in working capital and improving working capital efficiency. The pioneer work of Shin and Soenen (1998) and the more recent study of Deloof (2003) have found a strong significant relationship between the measures of working capital management and corporate profitability. Their findings suggest that managers can increase profitability by reducing the number of day's accounts receivable and inventories. This is particularly important for small growing firms who need to finance increasing amounts of debtors. Mahmood and Qayyum, (2010) pointed out that to increase profitability of a company and ensuring sufficient liquidity to meet short-term obligations as they fall due are two main objectives of working capital management. Profitability is related

to the goal of shareholders' wealth maximization, and investment in current assets is made only if an acceptable return is obtained.

Under the above background an effort has been made in this study to make an in-depth study of working capital management of Hindalco Industries Limited. Hindalco Industries Limited is the flagship company of the Aditya Birla Group and the leader in the aluminum and copper industry in India. The principal objective of the study is to analyze the size and composition of working capital of the company and the contribution of working capital management on the profitability of the company. Company's working capital performance is also compared with the industry to draw some meaningful conclusion. The findings of the study would help companies to design their working capital investments and the alternative of use of the same.

Research Methodology

The data required for this study have been extracted from secondary sources; Accord database and the annual reports of Hindalco Industries Limited. The study covers a period of 10 years starting from 2004 to 2013. The study covers the main aspects of working capital management including financing of working capital and the impact of working capital on profitability of the company. All the aspects of working capital are compared with the industry for meaning full conclusion. In order to identify the influence of profitability, a linear multiple regression model is used.

In the analysis, working capital ratios, viz., Current Ratio (CR), Liquid Ratio (LR), Inventory Turnover Ratio (ITR), Receivables Turnover Ratio (RTR), Cash Profit Margin (CPM), Working Capital to Sales (WCS) and Current Assets to Total Assets (CAT) are taken as independent variables. The Return on Assets (ROA) is used as dependent variables. The multiple regression equation used is:

$$ROA = a + b_1\,CPM + b_2\,ITR + b_3\,RTR + b_4\,WCS + b_5\,CR + b_6\,LR + b_7\,CAT + e$$

Where, a, b_1, b_2, b_3, b_4, b_5, b_6 and b_7 are parameters to be estimated.

Data Analysis

The following data analysis section is divided into four parts. First part deals with the analysis of working capital from different component point of view. The financing of gross working is discussed in part two. Different ratios and their relationship with the profitability are enumerated in part three. The fourth part of the data analysis covers the multiple regressions, where the profitability is the dependent variable and other ratios are independent. The last part of the data analysis covers the comparison of working capital performance of Hindalco with industry.

Analysis of Working Capital of Hindalco

Table-1 shows that the size of current assets increased from Rs. 3760 crore in 2004 to Rs.32300 crores in 2014. This increasing trend of current assets is regular throughout the period taken for the study. During the last ten years, the share of current assets to total assets is varying from 40 per cent to 83 per cent. The highest current assets to total assets recorded at 83 per cent in 2008. There are five varieties of current assets used by the company. The figures in the table show that the company invests maximum

capital in inventories and followed by receivables. This is because the company's average age of inventory is the highest in compared to other components of current assets (table-6). During the last three years the average age of inventory is over 97 days, which is much higher than the industry average. The inventory value ranges between 42 per cent of total current assets in 2009 to 57 per cent in 2006. The sundry debtor position also indicates the amount blocked with clients of the business for the receivable period allowed. The share of sundry debtor oscillates between17 per cent to 33 per cent of current assets during the study period. By holding above 40 per cent of the current assets of total assets during the last decade, it indicates that the firm follows a trade-off strategy between profitability and risk.

Financing of Working Capital

To meet the financial requirement, a business firm has various sources. A combination of long-term and short-term financing are normally supported to current assets. In Table-2, an attempt has been made to explain the relative importance of long-term and short-term debt in financing working capital. The highest percentage of long term funds used for short term purpose was during 2004. During 2004 Hindalco used 88 per cent of its long term funds for working capital requirement, but this dependency scaled down to 38 per cent in 2013. It is interesting to note that in most of the years, company utilized more than half of its working capital requirement from long term sources. This may occur be due to several reasons. The reasons may include; unavailability of opportunities for long term investments or long term projects are delayed or the expected return on investment is lowered down further. Companies also use aggressive strategy by using long term funds for short term purposes to make free flow of working capital investment. This is a better strategy to fulfil the order requirement of the clients and to maintain efficiency in working capital cycle. However this strategy enhances the cost of funds and is harmful to companies with shrinking turnover and lowering margin.

Impact of Working Capital on Performance

Table-3 indicates the different working capital related ratios with return on assets of Hindalco for the last ten years. The inventory turnover ratio of the company is hovering between 3.63 and 6.22. This ratio indicates the efficiencies of inventory management of the business. This is closely related to average age of inventory. The longer age of inventory, reduces inventory turnover and in turn increases cost and lower profitability. The relation between profitability and inventory ratio is positive but low at 0.22. The ratio of receivable turnover varies between 12 and 21 during the last ten years. This ratio indicates the efficiency of receivable collection of any business. As per table-6, during the last three years, the receivable days are comparatively less than the industry average. This shows a comfortable receivable management system of the company in compared to the industry. The correlation coefficient figure between receivable turnover and profitability also approves the same with a positive correlation of 0.45. The current ratio of Hindalco varies between 1.17 and 3.25 during the period covered in the study. This ratio shows the riskiness and solvency of the firm. High level of current ratio is an indication of higher liquidity than profitability intention of the business. The correlation coefficient results also support this argument with low degree of correlation between current ratio and profitability. The current ratio position of the firm is much higher than industry standard as reported in Table-6.

The liquid ratio of Hindalco has moved between 0.84 to 3.25 during the entire period of the study. High level of liquid ratio indicates a larger focus on solvency than profitability of the business. The correlation coefficient between liquid ratio and profitability is 0.27. This figure also signifies the plan of the business in maintaining working capital and profitability. Another very important indicator of working capital management of any business is working capital to sales. This ratio indicates the portion of sales held as working capital. Table 3 shows that this ratio is varying between 1.8 and 4.39 during 2004 to 2013. High working capital portion of sales indicates that the firm used either equity or debt financing for profitable investments. The correlation figure indicates a low degree of positive relation between the two indicators.

Multiple Regression Analysis

To study the impact of different working capital ratios on profitability of Hindalco, a multiple regression technique has been applied. Return on asset is taken as dependent variable where other seven working capital related ratios are taken as independent variables. Cash profit margin ratio, inventory turnover ratio, debtor turnover ratio, working capital to sales ratio, current ratio, quick ration and current asset to total assets are included in the list of independent variables taken for the applying multiple regression.

Table 4 shows the results of multiple regression. The results show that except cash profit margin ratio and debtors' turnover ratio other ratios are statistically significant at 5% significance. The coefficient values are positive for five independent variable cases except two. It is interesting that all coefficient values are more than one indicating a high sensitive impact of each working capital ratios on profitability. .

The beta coefficients of working capital to sales ratio and current ratio are showing negative coefficient values. This reflects the negative sensitivity of these two independent variables towards profitability as a dependent variable. The coefficient values of working capital to sales and current ratio are -1.99 and -2.71 respectively and both are statistically significant. This indicates that, with one unit increase in working capital to sales and current ratio would influence more than one unit decrease in profitability. The working capital to sales ratio indicates the proportion of sales utilized for working capital purpose. The regression results commensurate with the general principle of working capital management. Where the amount blocked in working capital would generate less returns and affects profitability. The similar judgment is applicable to current ratio, where high working capital margin affects the profitability of the business. High current ratio or working capital margin indicates the utilization of long term funds for short term purpose to avoid stock out situation. The multiple regression table explains that the independent variables explain 98.74% of the variations in the profitability of Hindalco. Thus, the overall results depicted in the table are satisfactory.

Hindalco and Industry Comparison

The parameters of performance evaluation of Hindalco and industry are summarized in table 5 below. It is revealed that the profit performance of the company is better in compared to the industry during last three financial years taken for comparison. In terms of return on assets, the company has done notably well than the industry. Return on assets recorded at 2.78 per cent in the last financial year than the industry performance of only

0.48 per cent. Similarly, the return to shareholders' equity is much impressive than the industry standard. During the last year, return on shareholder equity was 5.24 per cent comparing the industry performance of 0.85 per cent only. In terms of working capital cycle, Hindalco's performance is below industry standard. Hindalco takes 57 days to complete its cash cycle per year compared to 42 days of the industry. Hindalco needs on an average Rs3946 crores of working capital to finance this period of cash cycle. If Hindalco maintains the cash cycle of the industry, it would have required Rs2935 crores of working capital.

Conclusion

The above study is to investigate the working capital management practice of Hindalco industries. The research focused on the analysis of working capital management of the company and its impact on the profitability. It is found in the study that there is an increasing trend of current assets throughout the period. During the last ten years, the share of current assets to total assets is varying from 40 per cent to 83 per cent. Company invests maximum capital in inventories and followed by receivables. Company also utilized more than half of its working capital requirement from long term sources. The longer age of inventory, reduces inventory turnover and in turn increases cost and lower profitability. This is also been evident from the study. The relation between profitability and inventory ratio is positive but low at 0.22. The liquid ratio of Hindalco has moved between 0.84 to 3.25 during the entire period of the study. High level of liquid ratio indicates a larger focus on solvency than profitability of the business. The multiple regression results show that except cash profit margin ratio and debtors' turnover ratio other ratios are statistically significant at 5 per cent significance. The coefficient values are positive for five independent variable cases except two. It is interesting that all coefficient values are more than one indicating a high sensitive impact of each working capital ratios on profitability. Comparing company with industry also gives satisfactory results during the last three years taken for analysis. In most of the cases, the performance of Hindalco in working capital management is better than the industry standard.

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TABLE-1- Current Assets Components (Rs in Crores)

years	Inventories	Sundry Debtors	Cash and Bank	Other Current Assets	Loans and Advances	Total Current Assets	TA	CA/TA
2004	1703.37	751.74	283.12	522.69	499.54	3760.45	9422.49	0.40
	(0.45)	(0.20)	(0.08)	(0.14)	(0.13)			
2005	2697.04	840.44	473.05	442.03	499.56	4952.12	11,466.58	0.43
	(0.54)	(0.17)	(0.10)	(0.09)	(0.10)			
2006	4497.54	1305.66	1042.34	244.54	788.09	7878.17	14,509.69	0.54
	(0.57)	(0.17)	(0.13)	(0.03)	(0.10)			
2007	4812.33	1548.52	1034.47	121.98	1151.22	8668.51	19,777.27	0.44
	(0.56)	(0.18)	(0.12)	(0.01)	(0.13)			
2008	11110.87	6717.38	1716.87	70.4	1858.71	21474.23	25,764.40	0.83
	(0.52)	(0.31)	(0.08)	(0.003)	(0.09)			
2009	8524.13	6673.29	2191.76	54.64	2795.54	20239.36	32,082.61	0.63
	(0.42)	(0.33)	(0.11)	(0.003)	(0.14)			
2010	11275.41	6543.69	2195.39	56.87	3117.05	23188.41	34,267.87	0.68
	(0.49)	(0.28)	(0.09)	(0.002)	(0.13)			
2011	13742.01	7541.05	2539.95	1367.33	1705.43	26895.77	35,406.21	0.76
	(0.51)	(0.28)	(0.09)	(0.05)	(0.06)			
2012	13246.03	8017.17	3295.99	1482.78	2115.59	28157.56	44,388.02	0.63
	(0.47)	(0.28)	(0.12)	(0.05)	(0.08)			
2013	14331.68	8952.28	3769.51	2038.25	3208.79	32300.51	55,690.66	0.58
	(0.44)	(0.28)	(0.12)	(0.06)	(0.10)			

Source: Accord Database

*Figures in parenthesis are % of total current assets

TABLE-2- Current Liability and Financing of Working Capital (Rs. in Crores)

years	Current Liabilities	Provisions	Total Current Liabilities	Total Current Assets	Net Current Assets	CA/CL	CA/TA	Total LT debt	% CA from LTD
2004	1295.29	216.64	1511.93	3760.45		2.49	0.40	2564.59	0.88
	(0.86)	(0.14)			2248.5				
2005	1881.23	909.85	2791.08	4952.12		1.77	0.43	3800	0.57
	(0.67)	(0.33)			2161.04				
2006	2886.12	1024.96	3911.08	7878.17		2.01	0.54	4903.44	0.81
	(0.74)	(0.26)			3967.09				
2007	3053.41	1357.62	4411.02	8668.51		1.97	0.44	7359.24	0.58
	(0.69)	(0.31)			4257.49				
2008	11108.65	6111.4	17220.05	21474.23		1.25	0.83	8328.58	0.51
	(0.65)	(0.35)			4254.18				
2009	10946.2	6282.48	17228.68	20239.36		1.17	0.63	8324.29	0.36
	(0.64)	(0.36)			3010.68				
2010	13099.62	4916.96	18016.58	23188.41		1.29	0.68	6356.9	0.81
	(0.73)	(0.27)			5171.83				
2011	18272.69	1499.79	19772.48	26895.77		1.36	0.76	9039.89	0.79
	(0.92)	(0.08)			7123.29				
2012	18923.79	1377.07	20300.86	28157.56		1.39	0.63	14571.91	0.54
	(0.93)	(0.07)			7856.7				
2013	21540.91	1610.36	23151.27	32300.51		1.40	0.58	24144.77	0.38
	(0.93)	(0.07)			9149.24				

Source: Accord Database

*Figures in parenthesis are % of total Current Liabilities

TABLE-3- Performance Indicator Ratios (Working Capital) of Hindalco

Year	Cash Profit Margin	Inventory Turnover	Debtors Turnover	Working Capital/Sales	Current Ratio	Quick Ratio	CA/TA	ROA
2004	16.96	6.22	12.16	2.22	2.49	2.78	0.40	7.71
2005	17.1	5.88	15.54	2.28	1.77	1.89	0.43	10
2006	17.45	3.86	12.26	1.81	2.01	1.89	0.54	9.74
2007	16.08	4.74	14.47	1.8	1.97	2.67	0.44	11.7
2008	16.41	4.47	13.7	1.54	1.25	3.25	0.83	10.25
2009	14.58	4.3	14.26	2.16	1.17	2.9	0.63	6.65
2010	12.58	4.12	16.37	2.46	1.29	1.39	0.68	4.92
2011	11.14	3.74	19.75	4.16	1.36	0.84	0.76	4.84
2012	10.34	3.68	21.09	4.39	1.39	0.87	0.63	4.38
2013	8.56	3.63	19.08	2.7	1.40	1.28	0.58	2.78
Correlation Coefficient	0.1782	0.2213	0.4517	0.0315	0.1428	0.2723	0.2367	

Source: Accord database

Note: CR – Current Ratio, LR – Liquid Ratio, WTR – Working Capital Ratio, ITR – Inventory Turnover Ratio, RTR – Receivables Turnover Ratio, WC/TA – Working Capital to Total Assets, ROA – Return on Assets.

TABLE-4- Multiple Regression Analysis

Variables	Beta Coefficient Value	t-Stat	P-value
Intercept	0.0456	0.4565	0.3212
Cash Profit Margin	1.5093	7.7381	0.0162
Inventory Turnover	1.2981	-2.6587	0.1171
Debtors Turnover	1.5603	4.8033	0.0407
Working Capital/Sales	-1.9948	-2.9513	0.0981
Current Ratio	-2.7144	1.7873	0.1602
Quick Ratio	1.4982	1.6467	0.1342
CA/TA	1.2395	1.3561	0.7557
R Square		0.9874	

TABLE-5-Performance Ratios of Hindalco and Industry (Rs in Crores)

	2013		2012		2011	
	Company	Industry	Company	Industry	Company	Industry
Net Sales	26056.93	44492.42	26596.78	47194.28	23859.21	47070.09
PAT	1699.20	434.05	2237.20	1020.23	2136.92	3219.42
Cash Profit	2403.40	2078.37	2927.17	2690.98	2824.40	5597.68
Performance Ratios:						
ROA(%)	2.78	0.48	4.38	1.17	4.84	3.88
ROE(%)	5.24	0.85	7.31	1.97	7.42	6.73
ROCE(%)	4.92	2.54	7.14	3.46	7.81	7.42
Asset Turnover	0.46	0.53	0.55	0.58	0.57	0.61
Efficiency Ratios:						
Receivable days	19.13	26.94	17.30	27.37	18.48	24.52
Inventory Days	100.42	90.16	99.28	86.27	97.72	74.85
Payable days	59.77	56.36	67.42	74.16	55.22	73.58
Cash Conversion Period (days)	59.78	60.75	49.16	39.48	60.99	25.78
Working Capital need for Supporting Sales	4267.85	7404.77	3582.49	5104.11	3986.62	3324.98
Financial Stability Ratios:						
Total Debt/Equity (%)	0.73	0.76	0.46	0.69	0.30	0.73
Current Ratio	2.07	0.80	1.64	0.84	1.62	1.32
Quick Ratio	1.28	0.43	0.87	0.46	0.84	0.70

Source: Accord Database

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Determinants of Management Students' Engagement in a Women's University

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Abstract

Student Engagement refers to active involvement of students in educationally relevant and purposeful activities. To be meaningful, such involvement must not only be cognitive and emotional but also reflected in concrete behaviour through pursuit of various activities both inside and outside the classroom. It is widely believed that student engagement is a reasonable "proxy" of effective learning. Even though considerable academic and practical research continues to be done on this important topic in the United States, Canada and Australia, Indian educational system has remained impervious to it. The study on which this paper is based is part of a series of studies on the subject. It was carried out with a sample of 285 MBA students of an all-women Indian University. After an elaborate review of literature, the survey data was analysed using a variety of statistical tools and techniques, including principal component analysis, correlation, multiple regression, t-test, and analysis of variance. The findings reveal the level of student engagement in terms of its six dimensions and also identify the predictors of engagement.

Keywords: Student Engagement; Learning, Predictors of Engagement, Institutional Climate, Self-efficacy, Locus of Control

Introduction

This paper is based on a study that is part of a series of such studies on the topic of student engagement, which has so far remained unexplored in India. The earlier six studies on this topic were carried out with samples of MBA students drawn from co-educational business schools located in Delhi, Haryana and Rajasthan. The present study is based on a sample of 285 students pursuing the MBA course at an all-women university. It will be of interest to

find out whether the all-women character of the institution has any unique impact on the level of student engagement and/or its determinants.

In countries like United States, Canada and Australia where such studies are carried out on a regular basis, student engagement is viewed as a reasonable "proxy" of real and deep learning (Weimer, 2009). In India, where there is no institutionalized system to elicit such perceptual "feedback" from the students, the quality of educational inputs is judged mainly on the basis of grades or marks obtained, in tests and examinations. Since marks can be obtained, at least in some cases, through rote learning, this measure of quality can at best be described as cognitive or intellectual engagement. The lasting value of such learning is highly questionable. Therefore, it is desirable that the traditional methods of ascertaining whether learning has indeed taken place be supplemented by regular surveys of student engagement.

What is Student Engagement?

The student engagement construct has been conceptualized in two different ways. As per the most commonly employed conception, it refers to the manifest behaviour of students reflected in their active participation in educationally purposeful activities, both inside and outside the classroom (Kuh, 2003; Kuh et al., 2007). The annually conducted National Survey of Student Engagement (NSSE) in the United States is based entirely on this conception. Elaborating this conception, Trowler (2010) says that "student engagement is concerned with the interaction between the time, effort and other resources invested by both students and their institutions intended to optimize the student experience and enhance the learning outcomes and development of students as well as the performance and reputation of the institution". This definition concentrates mainly on the manifest activities of the students without taking into account the cognitive or emotional aspects of the attitudes of students that underlie their behavirour.

The alternative conceptualization views student engagement solely in terms of the attitude of students towards their learning experience. For example, Mann (2001) considers engagement as the antonym of alienation, while Maslach & Leiter (1997) consider it the exact opposite of burnout. Both alienation and burnout are attitudinal phenomena reflecting cognitive and emotional experiences of a person. Schaufeli et al. (2002) have defined student engagement more explicitly as a positive, fulfilling, and affective motivational state. Mosenthal (1999) too has argued that student engagement construct is grounded in the cognitive and affective systems of the learners.

Combining the two conceptions summarized above, Marks (2000) has defined student engagement more comprehensively as "a psychological process, specifically, the attention, interest, investment and effort students expend in the work of learning." According to Skinner et al. (1990), student engagement refers to students' initiation of action, effort and persistence on school work as well as ambient emotional states during learning activities. Cleary & Skaines (2005) too define student engagement as "the active involvement, commitment and a sense of belonging that dictate the time and effort students devote to educationally purposeful activities." The present study is based on this comprehensive meaning of the student engagement construct.

Student engagement is a multi-dimensional construct. However, as explained at length in some of the earlier papers in the series, there is as yet no agreement over the number or nature of the dimensions (Sharma, Khandelwal & Ningthaujam, 2012; Sharma & Bhaumik, 2013). One of the reasons for this lack of agreement is related to the fact that there are differences in the conceptualizations of the construct. For purposes of the present study, we have used six dimensions of student engagement, which cover cognitive, affective and behavioural aspects of the phenomenon. The choice of the six dimensions is consistent with the conceptualization of the student engagement construct adopted for this study..

Significance of Student Engagement

The significance of student engagement has been demonstrated, among other things, by its influence on the performance of students. Pascarella (1980) found a positive relationship between student engagement and variables such as satisfaction with college, educational aspirations, intellectual and personal development, academic achievement, and persistence in college. Several recent studies have also found a positive relationship between student engagement and outcomes such as educational development of students (Kuh & Umbach, 2004; Pike & Kuh, 2005; Strauss & Terenzini, 2007). Pike & Kuh, 2005) have provided a detailed review of literature on education that highlights the beneficial learning outcomes of student engagement. A diverse body of educational research has shown that active participation of students in the learning process influences academic achievement (Graham et al., 2007). Guided by this research–based evidence, educators seem to agree that student engagement is a reasonable "proxy" of effective learning (Weimer, 2009; Koljatic & Kuh, 2001).

Predictors of Student Engagement

Most of the empirical studies on the subject have examined the role of situational factors as the potential predictors of student engagement. This may be because student engagement is more directly influenced by characteristics of the institution than by any other factor (Astin, 1984; Fullarton, 2002). According to Handelsman et al. (2005), effective teaching stimulates and sustains student engagement. In a conceptual article, Hoffman (1996) has called for the creation of a faculty incentive system that rewards them for effective talent development.

Shernoff (2002) found that high school students were most engaged in the classroom when (a) the students are challenged in terms of academic intensity, (b) they can actively demonstrate their skills, and (c) they work in groups instead of listening to a lecture. Pike and Kuh (2005) have suggested that institutions differ in how they try to engage their students and no institution is uniformly high or low across all dimensions of engagement. A pilot study using a quasi–experimental classroom found that students from the technologically enhanced classroom showed significant increase in engagement and improved academic achievement (Carle, Jaffee & Miller, 2009).

A large-scale study of first-year undergraduate students of Australian universities revealed the importance of pedagogy and institutional support in enhancing the quality of students' experiences (Krause & Coates, 2008). The degree to which students perceive college environment to be supportive of their academic and social needs is found to be the single best predictor of college students' engagement (Astin, 1993; Pascarella & Terenzini, 2005).

Apart from the role of situational variables, personal attributes of the students are also found to influence student engagement. Personal attributes consist of both personality as well as demographic and family background of the student. Between the two, certain measures of personality have been found to be more important than background variables in terms of their influence on student engagement. Self-concept of ability is found to be a significant predictor of engagement (Fullarton, 2002; Rudolph et al., 2001). Duran et al. (2006) have found emotional intelligence and self-efficacy as the significant predictors of engagement. In a sample of Spanish and Belgian students, Salanova, Llorens & Schaufeli (2011) found a reciprocal relationship between self-efficacy and academic engagement.

The influence of background factors on student engagement is found to be neither very strong nor consistent. Kinzie et al. (2007) found female students to be more active than their male counterparts in their studies. Several other studies have reported similar results (Epstein et al., 1998; Drew & Work, 1998; Mortenson, 2006). However, gender disparity is not the undisputed conclusion of all studies on the subject. For example, ,Fritschner (2000) found no gender effect on active class participation, whereas Tannen (1990) and Fassinger (1995) found men participating more frequently than women. In a large study of high school students in Australia, Fullarton (2002) found a positive relationship between socio-economic background of the family and level of student engagement.

Methodology

About the Study: The study on which this paper is based is part of a series of studies on the subject of student engagement among MBA students in India. While most of the earlier studies were confined to different business schools located in the National Capital Region (NCR), the present study was carried out outside Delhi. The institution covered by this study is a department of management of an all-women, fully residential, deemed university. A random sample of 285 MBA students (of both first and second years) completed a specially-designed 79-item questionnaire. The selected sample size meets the twin conditions of 95% level of confidence, and 5% margin of error. The entire data was collected in the month of April, 2013.

Sample Profile: The sample consists of women in their early twenties. Only 12 out of the 285 respondents (4 percent) are more than 23 years of age and exactly the same number is below the age of 21, while 92 percent fall within the narrow range of 21 to 23 years. With mean age for the sample being 22, it shows that the MBA students of this university joined straight after their graduation from college without having any prior work experience.

In terms of prior educational background, there is considerable diversity. The students come from all kinds of subjects such as engineering, science, commerce, arts and business administration. However, a vast majority of them come from the commerce stream (41%), followed by business administration (31%). The remaining 28% belong to the other three streams, namely, science, arts and engineering in a descending order.

Almost two-third (66%) of the students come from cities, another 7% come from metros, while only 27% hail from small towns or villages. The predominant urban background of the students is also reflected in the level of education of their parents. Seventy percent of mothers and 85 percent of fathers of the students are graduates or postgraduates. Finally,

barring just 11 students, the remaining 96 percent of them (as per their own perception) belong to middle class (54%) or upper middle class (43%) families. Further details of the sample profile are provided in Appendix 1.

Dimensions of Engagement

Except for a few recent studies in which the first author has been involved, there are hardly any other studies on the subject of student engagement in India (Sharma, Khandelwal & Sombala, 2012; Sharma & Bhaumik, 2013; Sharma & Mittal, 2013). Even among the Western countries, where such studies are conducted more frequently, there is no consensus over the dimensions of student engagement (Sharma & Bhaumik, 2013). It was necessary, therefore, to determine the dimensions of student engagement for the present study.

For the study on hand, we started out with an item pool of 35 statements assumed to measure student engagement. Fifteen out of these items were taken from the student engagement questionnaire developed by Schaufeli et al. (2012), another five were adapted from the measure of organizational commitment developed by the first author (Sharma & Joshi, 2001), and the remaining 15 items intended to measure the manifest behavior of students were adapted from various sources including some of our own. In totality, this item pool of 35 statements covered the cognitive, affective and behavioural aspects of student engagement.

The responses of 285 students to the 35 items mentioned above were subjected to exploratory factor analysis (EFA) to identify any latent structure inherent in the construct. Using principal component analysis together with Kaiser mineigen greater than one criterion, 11 components were identified. However, three out of the 11 components were found to be single-item factors and hence were dropped. Also, six items out of the total 35 were found to have a factor loading of less than .50 on any of the 11 components and, therefore, were dropped. Based on this evidence, eight components comprising 26 items were identified wherein each component consisted of two or more items and each item had a factor loading equal to or greater than .50. Subsequent test of reliability revealed that Cronbach alpha for two out of the eight components was less than .60. These two components and their five constituent items were dropped from further analysis. Among the remaining six components we found one component wherein the deletion of one of the constituent items led to an increase in its reliability coefficient from .59 to .61. It was decided to drop the said item and to retain the component. In another 4-item factor, the content of one of the items was not in harmony with that of the other three items. It was also found that, if the said item was deleted, alpha for the remaining three items remained exactly the same (.61) as for all four items. Hence it was decided to drop the said item.

As a consequence of the procedure just described, we were left with 19 items out of the initial pool of 35 items. These 19 items constituting six components were once again subjected to EFA. This time, only six components emerged and each of them comprised of two or more items. Also, each of the 19 items had a factor loading of more than .50. Table 1 presents the rotated component matrix for these 19 items. The list of items included in each factor is provided in Appendix 2. After examining the item content, the factors have been named as follows:

Factor	Dimensions of Engagement	No. of Alpha	Cronbach
1	Diligent Pursuit of Studies	4	.69
2	Commitment to the Institution	3	.70
3	Emotional Engagement	3	.61
4	Active Academic Participation	4	.62
5	Absorption in Studies	3	.61
6	Interaction with Faculty	2	.61

Predictors of Student Engagement

Three personality scales consisting of 29 items were used as measures of personal attributes of students. These included a 10-item scale of self-efficacy, a 10-item scale of locus of control, and a 9-item scale of need for achievement. Each of these three sets of items was subjected to EFA separately using the procedure and norms already described for identifying the dimensions of engagement. The outcome of this analysis is described below:

Self–Efficacy: The 10 items of this scale yielded two factors. One of the items had a loading of less than .50 on either factor one or factor 2 and, therefore, was dropped. Six out of the remaining nine items had loadings equal to or higher than .50 on factor one, while the remaining three items loaded on factor two. The second factor failed to meet the minimum requirement of reliability ($\geq$ .60) either for 3 items as a whole or after deleting one of the items. Hence it was decided to ignore this factor and to retain only the first factor comprising of six items as a measure of self-efficacy. Cronbach alpha for this group of six items was found to be .61, which does not improve if any of the six items was dropped.

Locus of Control: This 10-item scale meant to measure **internal** locus of control yielded four factors. One of the 10 items loaded on **two** factors with a loading of more than .50 and hence was dropped. This resulted in factors 3 and 4 turning out to be single-item factors and, therefore, were also dropped. Five out of the remaining seven items loaded on factor one and the other two on factor two. The second factor had a very low Cronbach alpha (.315) and hence it was dropped, leaving us with only the first factor comprising of five items. Cronbach alpha for this factor was found to be .69, which did not further improve if any of its constituent items was deleted. This five-item scale was retained as a measure of internal locus of control for purposes of the present study.

Need for Achievement: This nine-item scale yielded three factors. Since none of them met the reliability requirement of $\geq$ .60, it was decided to drop this variable altogether.

Apart from the **personality** measures described above, we used 15 self-developed single-item measures of (a) core academic activities; (b) administration and infrastructure; and (c) facilities for certain non-academic activities. These institution-related factors were treated as the potential **situational** predictors of student engagement. When these 15 items were subjected to EFA, four factors emerged. One of them being a single-item factor was dropped, thereby leaving us with three factors. As two items had a factor loading of less than .50 on any of these three factors, it was decided to drop them. Cronbach alpha for the third factor consisting of three items was found to be .64. However, by deleting one of the items alpha for the remaining two items increased to .69. Hence it was decided to drop that

item as well. The three factors consisting of the remaining 11 items were found to have Cronbach alpha ranging between .69 and .71.

Table 1 Rotated Component matrix for the Selected 19 Items used as measures of Student Engagement (N=285)

Sl. No.	Item No.	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
1.	35	.622					
2.	37	.734					
3.	38	.631					
4.	49	.654					
5.	4		.735				
6.	31		.797				
7.	40		.760				
8.	64			.564			
9.	71			.709			
10.	73			.693			
11.	75			.742			
12.	2				.672		
13.	10				.717		
14.	11				.716		
15.	28					.696	
16.	29					.515	
17.	30					.590	
18.	8						.815
19.	26						.759
Cronbach Alpha		.69	.70	.62	.61	.61	.61

Notes: (1) Extraction Method: Principal Component Analysis.
(2) Rotation Method: Varimax with Kaiser Normalization.
(3) All factor loadings below 0.50 have been blanked out.
(4) Total variance explained = 58.327%.
(5) For details of items, refer to Appendix 1.

Given below is the list of the five potential predictors of student engagement described in this section, while Appendix 3 provides a list of their constituent items:

Sl. No.	Potential Predictors	No. of Items	Cronbach Alpha
	Personal Attributes		
1.	Self-Efficacy	6	.61
2.	Locus of Control (Internal)	5	.69
	Situational Predictors		
3.	Academic Inputs	4	.71
4.	Administration & Infrastructure	5	.70
5.	Placement Facilities	2	.69

Research Findings

Level of Student Engagement: The main findings of this study are presented in a summary form in Table 2. There is considerable variation in the level of student engagement in terms of its different dimensions. The highest mean score (66.42%) is found for active academic participation. This means that the students are seriously pursuing their studies. They take notes in the class and keep those notes and reading materials well organized. They work on their project assignments with other students and complete the same before the deadline.

Table 2 Descriptive Statistics for the Selected Dimensions of Student Engagement and Its Potential Predictors (N=285)

Sl. No.	Variable	No. of Items	Score Range	Alpha	Mean Score	Std. Dev.	$\overline{X}$ Score as %
	Student Engagement						
1	Active Academic Participation	4	0 - 12	.62	7.97	2.397	66.42%
2.	Emotional Engagement	3	0 - 9	.61	4.68	1.901	52.00%
3.	Diligence	4	0 - 12	.69	6.51	2.389	54.25%
4.	Absorption	3	0 - 9	.61	4.62	1.967	51.33%
5.	Commitment to the Institution	3	0 - 9	.70	4.06	2.307	45.11%
6.	Interaction with Faculty	2	0 - 6	.61	2.31	1.525	38.50%
	Potential Attributes						
7.	Internal Locus of Control	5	0 – 15	.69	11.24	2.662	74.93%
8.	Self-Efficacy	6	0 – 18	.61	10.60	2.850	58.89%
	Institutional Support						
9.	Administration & Infrastructure	5	0 – 15	.70	9.04	3.052	60.27%
10..	Academic Inputs	4	0 – 12	.71	5.58	2.592	46.50%
11.	Placement Facilities	2	0 - 6	.69	1.75	1.547	29.17%

Notes: (1) Mean score as percentage reported in the last column was calculated by dividing the mean score by the upper limit of its score range and multiplying the product by 100.

(2) To make the table reader-friendly, variables within each of the 3 categories have been listed in a descending order on the basis of their mean scores reported in the last column.

But their said behavioural manifestation of engagement is not backed by the other two behavioural manifestations. For example, the mean score for diligent pursuit of studies is quite modest (52%) and interaction with faculty both inside and outside the classroom is very low (38.50%). Likewise, the mean scores for the three cognitive and/or affective manifestations of engagement are also modest or low. For example, the mean scores for emotional engagement (54.25%) and absorption (51.33%) are quite modest, while the mean score for commitment to the institution (45.11%) is quite low.

Table 2 Descriptive Statistics for the Selected Dimensions of Student Engagement and Its Potential Predictors (N=285)

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	Potential Attributes						
7.	Internal Locus of Control	5	0 – 15	.69	11.24	2.662	74.93%
8.	Self-Efficacy	6	0 – 18	.61	10.60	2.850	58.89%
	Institutional Support						
9.	Administration & Infrastructure	5	0 – 15	.70	9.04	3.052	60.27%
10..	Academic Inputs	4	0 – 12	.71	5.58	2.592	46.50%
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Notes: (1) Mean score as percentage reported in the last column was calculated by dividing the mean score by the upper limit of its score range and multiplying the product by 100.

(2) To make the table reader-friendly, variables within each of the 3 categories have been listed in a descending order on the basis of their mean scores reported in the last column.

A low score for commitment to the institution comes as a surprise. The sample consists of only female students studying in one of the five all-women institutions in the country. One would expect that the young ladies who chose to join this unique institution would be particularly attached to it. A relatively low level of their commitment to the institution, therefore, raises a question as to whether the students really had a choice about joining this particular institution. The very low mean score for interaction with faculty is another enigmatic finding. In the literature on student engagement, such interaction with faculty, both inside and outside the classroom, is considered to be an important behavioural indicator of engagement. In an institution, which is fully residential and which happens to be located in a rural hinterland, the lack of adequate interaction with faculty is indeed surprising.

Status of Potential Predictors

Personal Attributes: Two measures of personal attributes (locus of control & self-efficacy) were used in this study. The mean scores for both of these measures are quite high. In fact, the score for locus of control (LOC) is the highest among all the variables listed in Table 2. The measures of both LOC and self-efficacy (SE) are based on students' own perceptions about themselves. In the psychological literature on these two topics, their measurement is always based on respondents' own perceptions.

Both LOC and SE are based on self-beliefs. A person with an internal LOC believes that the consequences of his actions are the result of his own effort. On the other hand, someone with an external LOC attributes those consequences to factors over which he has no control. In the present study, we have measured LOC in terms of internal locus of control. Therefore, the observed high LOC score (74.93%) means that the students are overwhelmingly internals. Self-efficacy (SE) reflects an optimistic self-belief, which indicates that one can perform a novel or difficult task and can cope with adversity. A fairly high mean score for SE (58.89%) shows a high degree of self-confidence and a positive belief in one's own competencies among the students

Institutional Support: Institutional support system was measured in terms of its three parameters: (a) academic inputs: (b) administration and infrastructure; and (c) placement facilities. The students have given a fairly high rating to administration and infrastructure (60.27%), a very modest rating to academic inputs (46.50%), and an extremely low rating to placement facilities (29.17%).

A relatively low level of commitment to the institution (45%) and fairly high mean score for the administration of the institution (60%) may appear as contradictory findings. However, this need not be so if we look at the constituent items of these two variables listed in Appendix 1 and Appendix 2. Whereas commitment to the institution is based on an overall evaluation of its quality, the role of administration is measured mainly in terms of provision of various infrastructural facilities.

The students are found to be quite satisfied with the facilities provided by the administration (e.g., hostel, canteen, and extracurricular activities) and also with the helpful way in which it deals with their problems and concerns. But they are not very happy with the academic inputs provided by the faculty and they are also highly dissatisfied by the lack

of adequate placement facilities. In other words, even though the students view the physical infrastructure provided by the administration as quite adequate and its dealings with the students quite helpful, their overall low level of engagement with the institution is apparently for reasons that are not confined to the said contributions of the administration. The students are apparently more concerned about the academic inputs and placement facilities, both of which indicate scope for improvement.

Predictors of Student Engagement

Table 3 presents inter-correlation matrix for all selected variables. With six measures of student engagement and five measures of potential predictors, there are 6 x 5 = 30 correlations, which have been highlighted in Table 3. A closer look at these 30 correlations will reveal that, between the two sets of potential predictors, the two personal attributes (locus of control & self-efficacy) are far more effective than the three institutional support variables in influencing student engagement. Among the three institution-related variables, academic inputs has emerged as the highly robust predictor, whereas the other two (administration & placement) are found to make only marginal contribution in influencing student engagement.

The association between student engagement and various potential predictors shown in Table 3 is based on one-to-one (bivariate) correlations. These can sometimes be superious and, therefore, are only indicative (not definitive) of the real relationships. To find the critical predictors of a dependent variable (criterion) in such cases, it is advisable not to rely only on bivariate correlations. Instead, it is more appropriate to work out a multiple correlation, which gives a more reliable combination of the critical predictors. In the present case, we employed stepwise multiple regression technique to identify the said combination of critical predictors for each of the six dimensions of student engagement. The results of this analysis are summarized in Table 4.

Placement facility, which was the lowest-rated among all the variables in this study, has not emerged as a critical predictor of any of the six dimensions of student engagement. Administration & infrastructure too has turned out to be of limited importance as it is found to influence only one out of the six dimensions of engagement – namely, active academic participation. As against these two situational variables, the third situational factor (namely, academic inputs) has emerged as the most powerful determinant among all the critical predictors of student engagement.

Next to the situational factor called ‘academic inputs”, the two personality variables are found as the other critical predictors of engagement. Between these two, “self-efficacy” is more important than “locus of control” as the former influences five out of the six dimensions of engagement, while the latter affects three out of the six dimensions. It is important to emphasize here that neither academic inputs alone nor personality alone explains the total variance depicted in Table 4 in the form of multiple correlation (R^2). These two types of variables influence engagement through their interaction with one another.

Table 3 Inter-Correlation Matrix for the Selected Variables (N=285)

Sl. No.	Variable	AP (1)	EE (2)	DIL (3)	ABS (4)	COM (5)	FAC (6)	LOC (7)	SE (8)	ADMN (9)	ACAD (10)	PLACE (11)
1	Academic Participation (AP)	1.000	-.027^{ns}	-.064^{ns}	-.003^{ns}	.049^{ns}	.059^{ns}	**-.117***	**-.005^{ns}**	**.431*****	**-.064^{ns}**	**-.043^{ns}**
2	Emotional Engagement (EE)	-.027^{ns}	1.000	.364***	.375***	.281***	.219***	**.279*****	**.352*****	**.003^{ns}**	**.300*****	**.115^{ns}**
3	Diligence (DIL)	-.064^{ns}	.364***	1.000	.489***	.345***	.239***	**.277*****	**.376*****	**-.029^{ns}**	**.447*****	**.122***
4	Absorption (ABS)	-.003^{ns}	.375***	.489***	1.000	.317***	.239***	**.239*****	**.411*****	**.015^{ns}**	**.381*****	**.051^{ns}**
5	Commitment to the Instn. (COM)	.049^{ns}	.282***	.345***	.317***	1.000	.166**	**.068^{ns}**	**.302*****	**.011^{ns}**	**.571*****	**.037^{ns}**
6	Interaction with Faculty (FAC)	.059^{ns}	.219***	.239***	.239***	.165**	1.000	**-.051^{ns}**	**.212*****	**.013^{ns}**	**.289*****	**.043^{ns}**
7	Internal Focus of Control (LOC)	**-.117***	**.279*****	**.277*****	**.239*****	**.068^{ns}**	**-.051^{ns}**	1.000	.405***	-.086^{ns}	.014^{ns}	.067^{ns}
8	Self-Efficacy (SE)	**-.005^{ns}**	**.352*****	**.376*****	**.411*****	**.302*****	**.212*****	.405***	1.000	.023^{ns}	.221***	.021^{ns}
9	Administration & Facilities (ADM)	**.431*****	**.003^{ns}**	**-.029^{ns}**	**.015^{ns}**	**.011^{ns}**	**.013^{ns}**	-.086^{ns}	.023^{ns}	1.000	-.032^{ns}	.320***
10	Academic Inputs (ACAD)	**-.064^{ns}**	**.300*****	**.447*****	**.381*****	**.569*****	**.289*****	.014^{ns}	.221***	-.032^{ns}	1.000	.094^{ns}
11	Placement Facilities (PLACE)	**-.043^{ns}**	**.115^{ns}**	**.122***	**.051^{ns}**	**.037^{ns}**	**.043^{ns}**	.067^{ns}	.021^{ns}	.320***	.094^{ns}	1.000

*** P<.001 ** P<.01 * P<.05 ns = not significant

Role of Background Factors

Apart from the two personality variables and the three institutional support factors already mentioned, we now turn to certain demographic background factors as the potential predictors of student engagement. Since most of the background factors are based on either nominal or ordinal scale of measurement, their role could not be assessed through correlation and regression analysis already presented. Instead, we have relied on difference-of-means (t) test and analysis of variance (F) test to ascertain whether there is any association between various dimensions of student engagement and any of the following five background factors:

(1) Rural-Urban Background
(2) Socio-Economic Status
(3) Educational Background
(4) Mother's Education
(5) Father's Education

Rural-Urban Background: Out of the six dimensions of engagement, only "diligent pursuit of studies" was found to be significantly associated with rural-urban background of the students. We found the mean score for diligence to be higher among students from villages and small towns ($\overline{X}$ = 7.00) than that of their counterparts from cities and metros ($\overline{X}$ = 6.33). The observed mean difference of 0.671 was found to be statistically significant (t = 2.129; df = 283; P<.05). No significant association was found between rural-urban background and any of the remaining five dimensions of student engagement.

Socio-Economic Status: No significant association was found between socio-economic status and any of the six dimensions of student engagement.

Educational Background: At least two out of the six dimensions of student engagement were found to be influenced by the educational stream that the students came from. In the case of both "diligence" and "absorption", students coming from business administration and arts background were found to score higher than their counterparts from the commerce background. No significant difference was found between students from engineering or science background and those from commerce, arts or business administration streams.

Table 4 The Critical Predictors of Student Engagement (N=285)

Sl. No.	Predictors	Commitment to the Institution	Diligent Pursuit of Studies	Absorption in Studies	Emotional Engagement	Interaction with Faculty	Academic Participation
1	Academic inputs	B = .529***	B = .397***	B = .314***	B = .248***	B = .254***	--
2	Self Efficacy	B = .185***	B = .213***	B = .295***	B = .221***	B = .156**	--
3	Locus of Control	--	B = .185***	B = .115*	B = .186***	--	--
4	Administration & Infrastructure	--	--	--	--	--	B = .431***
	R^2 :	.357	.309	.268	.204	.106	.186
	Adjusted R^2:	.352	.301	.261	.196	.100	.183
	F-Ratio:	78.182	41.837	34.357	24.059	16.786	64.699
	Significance:	P<.001	P<.001	P<.001	P<.001	P<.001	P<.001

***** P<.001** **** P<.01** *** P<.05**

Notes: (1) The critical predictors of student engagement reported in this table were identified through stepwise multiple regression analysis.

(2) The letter "B" stands for standardized beta coefficient.

Mother's Education: The level of mother's education was found to affect three out of the six dimensions of student engagement. Not very strong but statistically significant negative association was found between mother's education and the following dimensions of student engagement:

Diligence	**Absorption**	**Commitment**
F = 3.512	F = 3.438	F = 4.249
df = 2,282	df = 2,282	df = 2,282
(P<.05)	(P<.05)	(P<.05)

The level of mother's education was measured in terms of three slabs: (a) undergraduate; (b) graduate; and (c) postgraduate. Post hoc analysis after ANOVA revealed the precise nature of the relationship between mother's education and the said three dimensions of engagement, as shown below:

Diligence	**Absorption**	**Commitment**
Students whose mothers are undergraduate are more engaged than those whose mothers are graduates	Students whose mothers are undergraduates are more engaged than those whose mothers are post-graduates	Students whose mothers are undergraduates are more engaged than those whose mothers are post-graduates
$\overline{X}$ Difference = 0.890 (P<.05)	$\overline{X}$ Difference = 0.761 (P<.05)	$\overline{X}$ Difference = 0.961 (P<.05)

Father's Education: Surprisingly, no association was found between father's education and any of the six dimensions of student engagement. Since the respondents are all females, it seems that most of them identify themselves with and are influenced by what they see in their mothers rather than fathers. This, however, is a conjecture. Further research is required to find a valid explanation for this intriguing finding.

Discussion and Conclusion

The sample for this study consists of 285 postgraduate students studying management at an all-women deemed university. Practically all of them are in their early twenties. Almost three-fourth of them had studied commerce or business administration during their undergraduate studies. About the same proportion hails from cities or metros and from homes where both parents were college graduates or postgraduates. As per their own perception, none of them belongs to lower class, only very few belong to either lower middle class or upper class, while an overwhelming majority belongs to either middle class (50%) or upper middle class (43%).

This study is based on survey research and the entire data was collected by using a 79-item structured questionnaire. Before using the data, the inherent factor structure of various item clusters was identified, which was followed by a variety of tests of reliability to ensure that the respondents were consistent in responding to the similar sets of items. As a result of this elaborate process already explained in the section on methodology, we had to discard data pertaining to 38 items. In other words, this paper and its findings are based on responses of 285 students to only 41 out of the 79 items.

Consistent with universal experience, this study has affirmed that student engagement is a multi-dimensional construct. Out of the six dimensions identified through principal component analysis, three represent behavioural manifestation of engagement. These are: (a) diligent pursuit of studies; (b) active academic participation; and (c) interaction with faculty. The other three dimensions relate to cognitive and/or affective engagement. These are; (a) commitment to the institution; (b) emotional engagement; and (c) absorption in studies. The students are found to demonstrate different levels of engagement across the six dimensions. They are highly engaged in terms of active academic participation, which means taking notes in class, keeping those notes and materials well organized, working with other students to prepare project assignments, and completing those assignments before the deadline. Except for this behavioural manifestation of engagement, the students' level of engagement in the other five dimensions is found to be quite modest or (in some cases) quite low.

Correlation and regression analysis has helped in identifying the critical predictors .for each of the six dimensions of student engagement. A combination of the two personality variables (locus of control and self efficacy) along with "academic inputs" as the situational variable has emerged as the best predictor for several dimensions of engagement. "Placement facilities" is found to play no role in influencing any dimension of engagement, while "administration and infrastructure" is found to make only a marginal contribution.

This study, as already stated, is part of a series of studies on the subject of student engagement. It should, therefore, be of interest to compare the main findings of this study with those of the earlier studies. The level of student engagement found in the present study across various dimensions is more or less similar to that found in earlier studies (Sharma, Khandelwal & Ningthaujam, 2012; Sharma & Bhaumik, 2013; Sharma & Mittal, 2013). Likewise, three out of the four predictors reported in Table 4 are also the same as those found in some of the earlier studies. For example, faculty inputs had emerged as one of the critical predictors in at least two studies (Sharma & Bhaumik, 2013; Sharma & Mittal, 2013). Another predictor (self-efficacy) was also found in three previous studies (Sharma, Khandelwal & Ningthaujam, 2012; Sharma & Singh, n.d.; Sharma & Saxena, n.d.). Finally, administration and infrastructure too had emerged as a very important predictor of student engagement in a number of earlier studies (Sharma, Khandelwal & Ningthaujam, 2012; Sharma & Bhaumik, 2013; Sharma & Singh, n.d.; Sharma & Saxena, n.d.)

Earlier in this paper it was speculated that the all-women character of the student population being studied might produce results that are unique and different from the results of studies of mixed populations. Since this happens to be the seventh study in the series, and the only one with an all-women sample, we compared its findings with those of the earlier six studies. All seven institutions were ranked from top to bottom on the basis of their mean scores for (a) the level of student engagement, and (b) the climate of the institution as perceived by its students. The institution where the present study was conducted ranked fifth on the said two parameters. The two institutions that ranked number 6^{th} and 7^{th} were well-known institutions located in the National Capital Region (NCR). The all-women composition of the student population under study does not appear to have any dramatic effect on the results of this study.

The findings of this study suggest that the questionnaire used for collection of data on student engagement and its predictors is indeed reliable as it is capable of generating data that can be used to test several hypotheses. Also, the findings of the present study, like those of the previous six studies, can be used to develop action plans for further improvement of the level of student engagement within each institution that we studied. Since engagement is viewed as a "proxy" of real and deep learning, raising the level of student engagement would ipso facto result in improving the quality of education.

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Appendix 1

Background Profile of the Sample

Sl. No.	Background Variable	Number	Percent
1.	**Age**		
	19-20	12	4.21
	21	81	28.42
	22	129	45.26
	23	51	17.90
	24-25	11	3.86
	29	1	0.35
	Total:	**285**	**100.00**
2.	**Educational Background**		
	Engineering	19	6.67
	Science	34	11.93
	Commerce	118	41.40
	Arts	27	9.47
	Business Admn.	87	30.53
	Total:	**285**	**100.00**
3.	**Rural-Urban Background**		
	Village	14	4.91
	Town	64	22.46
	City	188	65.96
	Metro	19	6.67
	Total:	**285**	**100.00**
4.	**Mother's Education**		
	Undergraduate	86	30.18
	Graduate	115	40.35
	Postgraduate	84	29.47
	Total:	**285**	**100.00**
5.	**Father's Education**		
	Undergraduate	42	14.74
	Graduate	112	39.30
	Postgraduate	131	45.96
	Total:	**285**	**100.00**
6.	**Socioeconomic Status***		
	Lower Middle Class	3	1.07
	Middle Class	149	53.02
	Upper Middle Class	121	43.06
	Upper Class	8	2.85
	Total:	**281**	**100.00**

* The measurement of this variable is based entirely on self-perception of the students. Four students chose not to answer this question.

Appendix 2

Selected List of Items used as Measures of Student Engagement

Factor 1: **Diligent Pursuit of Studies**

1. (35) I come well-prepared for the class.
2. (37) I feel full of energy when I am studying or attending my classes.
3. (38) I find my studies full of meaning and purpose.
4. (49) I work hard to meet the expectations of my teachers.

Factor 2: Commitment to the Institution

5. (4) If a friend of mind is considering joining this institute, I will encourage him/her to do so.
6. (31) Based on my experience as a student here, I feel that my decision to join this institute was correct.
7. (40) In my overall assessment, this is one of the best business schools in India.

Factor 3: Active Academic Participation

8. (64) I take notes during the class.
9. (71) I work with fellow students to prepare project assignments.
10. (73) I complete my class assignments before the deadline.
11. (75) I keep my class notes and materials well organized.

Factor 4: Emotional Engagement

12. (2) I am glad to find my studies challenging.
13. (10) When I am working on my studies, I feel bursting with energy.
14. (11) My studies are quite inspiring.

Factor 5: Absorption in Studies

15. (28) I can continue working on my studies for long periods at a time.
16. (29) I feel proud of my studies.
17. (30) Most of the time I am absorbed in my studies.

Factor 6: Interaction with Faculty

18. (8) I often ask questions in the class.
19. (26) I approach my teachers outside class hours to discuss course-related problems.

Note: The figures shown within parentheses are the serial numbers of statements as these appear in the questionnaire.

Appendix 3

Selected List of Items used as Measures of the Potential Predictors of Engagement

A. Personal Attributes

1. Self-Efficacy

1. (5) I can always manage to solve difficult problems if I try hard enough.
2. (14) If someone opposes me, I can find means and ways to get what I want.
3. (23) It is easy for me to stick to my aims and accomplish my goals.
4. (32) I am confident that I could deal efficiently with unexpected events.
5. (41) Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. (51) I can remain calm when facing difficulties because I can rely on my coping abilities.

2. Locus of Control (Internal)

7. (9) Success can be achieved through hard work and persistence.
8. (36) If the cause is right, one can surely convince others.
9. (45) Success depends largely on one's ability and effort.

10. (50) If one knows how to deal with people, it is easy to lead them.
11. (55) The rewards one gets depend largely on one's own efforts.

B. Institutional Support

3. Academic Inputs

12. (25) The academic inputs provided by the faculty are excellent.
13. (34) The teachers use an adequate mix of tools and techniques to impart knowledge and skills.
14. (43) The institute provides latest version of information technology to facilitate learning.
15. (53) The institute provides state-of-the-art classroom facilities.

4. Administration & Infrastructure

16. (58) The institute has a transparent and effective grievance-handling system to resolve the complaints of students.
17. (67) In their dealings with the students, members of the faculty and staff are quite helpful.
18. (72) The canteen facilities of the institute are quite good.
19. (74) The institute provides adequate facilities and avenues for extra-curricular activities.
20. (76) The hostel facilities provided by the institute are adequate.

5. Placement Facilities

21. (70) The institute provides effective final placement facilities to the students.
22. (78) The institute provides excellent summer placement facilities to the students.

Note: The figures shown within parentheses are the serial numbers of statements as these appear in the questionnaire.

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Future of Aesthetics in Marketing

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Abstract

This article is based on an interview with Rajat Kanti Baisya who is currently Professor of Marketing at Woxsen School of Business, Hyderabad. Dr Baiysa has held top management positions in Emami, Reckitt Benckiser, Escorts, etc. He has written over 350 research papers and several books including *Aesthetics in Marketing* published by Sage. In this article Dr Baisya has discussed evolution of aesthetics in marketing, use of aesthetics in marketing campaigns and how aesthetic marketing adds value to the overall consumer experience. The interview also highlights issues, challneges and future of aesthetics in marketing.

Keywords: Aesthetics in Marketing, Consumer Experience, Marketing Campaigns

How the concept of 'aesthetics in marketing' evolved?

When man first started using tools, he was looking at purely from the point of view of his functional requirements, the utility which he can attach with the tool, once as things evolved and he started owning this tool and it became one of his personal items and he no longer was seeing this as a functional tool, he started admiring this ownership. Soon functional aspect became 'divorced' from the product and man started 'beautifying' his tools and belongings as his admiration for owing and possessing increased. This gave way to what we call 'Aesthetics' it is when the form in the product got divorced or separated from it and started creating its own identity, rules and image.

We see that a product or any possession of man need not be only be there with him from only the functional standpoint but also from the perspective that he wants to 'own' or holds on to something he 'likes'. This changing orientation of man towards admiration of something which is beautiful or he perceives it is a 'beauty', this perception in a humanleads the concept of 'Aesthetics in Marketing'. However beauty is not related to his eye alone…..but his entire senses…be it be eyes, ears, nose, feel and the pleasure he gets in using the asset he has. Aesthetics is not only what he perceives to be Visually good that is beauty to the eyes….but also to his Olfactory and Auditory Senses, his Ergonomics Experience and the overall Pleasure he gets out of the entire experience.

This overall feeling which overwhelms a person can be used to market and position products and services as aesthetics.

Why should organizations emphasize on use of aesthetics in marketing campaigns?
Product performance in the marketplace is always a challenge for a marketing manager. Even though adequate market research supported by use of technology, engineering, R&D and good human resource is done before the launch of the product, the guarantee whether the product will succeed in the marketplace cannot be assumed. This thought is perhaps one of the worst nightmares a marketing manager or a business manager can ever have.

While marketing a product many variables like price, quality, features, novelty, competition, positioning, promotion etc. play a major role, most of the product differentiations are centred on these. Globalisation, Industrialisation and development across countries saw competition getting intense and the points of differentiation between products coming down. This was primarily due to availability of technology and the time taken to develop these as the result of changing consumer needs and their demand to have frequent changes in the product.

If we consider the case of durables, specifically automobiles and home appliances, we find the retention or ownership period of the same has reduced considerably over time, a car which a consumer kept for maybe around ten years earlier have now dropped to two to five years. This called for companies coming out with newer products frequently to satisfy consumer needs and be ahead of competition. Coming up with new products frequently is also a costly phenomenon, therefore the challenge is how to design products which will have an acceptability for a longer period within the consumer base.

Considering these aspects, one on the variables which has emerged as important lately is 'Design' of a product and if we drill down further we find that 'Aesthetics' may offer optimum solutions to that part of Design which will have a longer retention in the mind of the consumer and which may be developed at a lesser costs. 'Aesthetics Image' in the product built that extra loyalty in the owner in liking the product. It certainly can be a one differentiator which will be difficult to catch up for a competitor. As technology development cycle has reduced considerably leading to drastic reduction in time to market new products and when one product is almost similar to other competing products in the market in terms of benefit, functionality and other features delivered through similar technology, 'design aesthetics' serves as an important aspect of product differentiation which in turn helps in getting better price for the product as aesthetics improves the price – value perception of the product in the consumers mind.

Advances in information and communication technologies have influenced traditional paradigms of reaching out to the consumers. What are the challenges in aesthetic marketing in the wake of changing scenario?
Any technologies whatsoever has come and gone…..including advances it has failed to change the basic human being…..and touch his 'basic human liking' towards, taste, his orientation towards art and architecture….beauty as such like…..beautiful things…etc. if we see whatever we are doing in technology is focusing on making things convenient…..however a man liking and having affirmative reservations towards beauty is still un-relented and most of the things he likes to own has a strong admiration to the aesthetics and the pride he attaches in such ownership. Aesthetics is one of the root or a basis human liking…..which always will find place in man's …..mind ….and heart….equally…..

"A thing of Beauty is a Joy forever" still holds good. It also should be kept in mind that 'beauty is in the eye of the beholder' and as such something beautiful to one may not be so to another. Aesthetics thus has a strong contextual connection with the relevant target segment and marketers will have to keep this mind when deciding to create a new product and also while communicating the value of aesthetics to the target consumers. This itself is great challenge.

However the right communication to the consumer will play a great role, in making this to happen an organization has to focus on creating a 'Strategic Vision' in creating products and services with a "aesthetic sense' encompassing all the elements of aesthetics and thus creating an aesthetic image which will create a point of differentiation for the company. This is important for a highly cluttered market where products are fighting for the market share.

The biggest challenge for the company is to understand this "Strategic Vision'. Let us take an example of Harley Davidson, its designs are all evolved from what we call as the 'Garage Factor' and it continues to have that as a differentiator…..

Are Indian organizations receptive to the concept of 'aesthetics in marketing'?
Indians are also humans…….and our evolution shows how we were attached to aesthetics…some of the phenomenal examples….The TajMahal and many such architectural masterpiece…our paintings, scripture, design of weapons and armors….

Recently…in India we have set up "India Design Council' based on the guidelines of the National Design Policy, with the following objectives of Design Awareness and Promotion

- Creating public awareness on quality design its effectiveness: Use of design as strategic element for business excellence and as a key factor for innovation, to improve people's quality of life.
- Promoting design awareness and effectiveness programs in private public sectors- Country based Brand building - Design Promotion/ Exhibitions/ Conferences/ Seminars.
- Promoting Design as a tool for innovation, productivity and economic competitiveness in business and industry.
- Encouraging Micro, Small Medium industries to follow the best design practices.
- Promoting the concept of environment friendly designs and promote designers and industry to work towards environment friendly design.

This is a good start… we need to take it up further. There are organization which have started focusing on aesthetics, it is quite encouraging in the lifestyle products, and we can see a positive movement towards other functional products like automobiles, white goods etc…. packaging is also moving in the right directions. Aesthetics aspects or issues of a product or service has an universal appeal and Indians are no exception and therefore, in this market also aesthetics will continue to be a great differentiator particularly when products are fighting in a fiercely competitive marketplace for their share of the total cake. Some of the very evolved market such as France, aesthetics issues are a major differentiator as consumers take it granted that product(s) they buy will perform in any case. For example,

a car door making loud sound while closing or a durable product found to be noisy while using will never find acceptance in French market.

How aesthetic marketing adds value to the overall consumer experience?
Aesthetics is all about experience of ownership. We have attempted to define aesthetics by broadening the understanding of the elements it is composed of, it draws attention to all the senses thus introducing the concept of total aesthetic experience in a product. This experience if properly understood and leveraged can result into developing products which are likable, dynamic and resulting into success stories.

Once having zeroed down on the fact that aesthetic aspect in a product is vital, it is important to understand what exactly are these aesthetic aspects and how these aspects and aesthetic elements in a product influence purchase decisions. We can then look into various aesthetic attributes and qualities in a product and how much they are associated with each other so that while designing products how much weightage has to be given to each one of them. It is important to understand how each of these attributes, qualities and elements of aesthetics play a role in a product and what sort of balance between each one has to be there in a product for designing successful products.

At various stages of purchase, variables which are considered as most important at a particular stage changes importance as a customer completes the purchase process. For instance while purchasing, price may be the most important variable, but once a consumer owns a product, this may change to the quality or aesthetics of the product.

In our study we have found that aesthetics aspects of the product(s) considerably improves the perceived value of the product(s). We have even attempted to quantify the consumers intention to either buy or to even pay a premium for better aesthetics of the product and we found that not only product acceptance resulting into buying intention improves significantly but also consumers are willing to pay much higher price to the extent of about 15% for products designed keeping better aesthetics in mind.

What is the future of 'aesthetics in marketing' especially in the context of budgetary constraints due to recessionary pressures and continuing trends of economic slowdown across the world?
Focusing on 'Aesthetics' is not about increasing the input cost in a product….but it is about the value one brings in the product by virtue of improving the products' Aesthetic Image… and thus taking it closer to the consumer….and making sure that the consumer sees value in it more than for the functional purpose he has bought it for. As mentioned earlier organisations need to build a Strategic Vision to inculcate this Aesthetic Value and create products which will be dynamic and retain their differentiation….

On the contrary an aesthetic culture in the company will help to address the challenges in the economy which come time to time. This is a factor organizations cannot afford to overlook. In fact our book offers a methodology to look at the orientation of an organization towards Design and Aesthetics culture by doing couple of Design Sensitivity Audits and conducting a Design Management Effectiveness Study.