



Challenges Faced in Transforming the Data in Fast Changing World Towards Meaningful Higher Education

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ABSTRACT

The present-day world is characterised by an increasing population and increasing interdependencies among nations. These increasing interdependencies have resulted in the need for improving bilateral and multilateral transactions, which have generated vast amounts of data. Further, the increasing interactions among people through multiple communication channels worldwide have resulted in an explosion of data.

Since data is the raw material for getting meaningful and actionable information and recognising the differences in emerging patterns, constant association and sharing of the past, emerging and future data is essential to arrive at the hidden patterns of changing trends. Tracking the changing trends is very much crucial for making higher education meaningful in terms of character-building and developing relevant skills. The present work was taken up in this context and attempts in this direction by addressing the research question of ‘what are the challenges in linking the phenomenon of flooding of data and transforming the same into meaningful information necessary for making our higher education system purposeful’.

The research adopts the approach of multiple research methods, viz., collating experts’ opinions through Delphi technique iterations, interviews with associated professionals, and a purposeful literature review. Based on the research, it was concluded that more interdisciplinary and trans-disciplinary interactions with open-mind are necessary to make the Indian higher education system more skill-oriented and sustainable. Based on the study, suggestions and recommendations were listed.

Keywords: Linking Data, Information, Higher Education, Interdisciplinary, Trans-disciplinary

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1. Introduction

The distinction between data and information holds the key to successfully installing and utilising an information system, be it manual or operated with a computer and associated paraphernalia. “Data” is the collection of facts, opinions, estimates and observations about objects, persons and situations with the purpose of giving basic exposure to reality. Data have two main components facts and opinions, based on which data can be objective or subjective. Information, in contrast, is processed data. Here, the term ‘processed’ refers to answering applicable questions of what, why, when, where, who and how about the data to get the supplementary data and arranging the supplementary data logically to get a picture of the reality. Since “information” gives a picture of reality, it facilitates decisions and actions. In other words, the term “transformation of data” means transforming the data into “information”, which, in turn, facilitates the decisions and actions necessary for the survival of a person, organisation or nation in the external world.

To effectively utilise data, the transformation processes need to be continuous. This will enable the available and emerging data to provide an increasingly refined set of information, provided the information goes through a repetitive sequence of steps. These repetitive sequences of steps of Collection/Generation, Categorization, Comparison, Interpretation, Action and Feedback to information are termed an “information cycle”, and an information cycle provides a much better and more practically relevant platform to define an information system. Information tends to get more and more organised and refined with each stage of the information cycle.

The present-day world is highly dynamic due to changes happening in multiple dimensions, such as an increase in population, changes in the climate, changes in the economy and changes in political systems. Every object and idea in this world, for which information is not an exception, is constrained by a generalised life cycle consisting of stages of birth, the initial period of stabilisation, a period of utility, a period of decline and finally, death. The period of utility is referred to as *shelf-life*. A period in which an idea, an innovation or a piece of information remains an asset or provides a competitive advantage. The period of usefulness or relevance cannot go on for long. Further, the degree of usefulness/relevance gradually diminishes, and interestingly, this period of usefulness is equally applicable for both the process stages and the final output.

“Education” may be defined as the continual communication process of instilling attitudes and values leading to successful adoption to the external world using knowledge and skills. In primary education, “successful adoption” is focused on basic survival requirements through literacy, congenial emotion and social skills. In secondary education, “successful adoption” is focused on general survival skills viz., critical thinking, creativity and independence. In higher education, “successful adoption” is focused on developing a person to be independent while facing economic, technological, and social changes. Thus, for effective higher education, data is essential for tracking social, economic, and technological changes and the state of development of an individual to be independent.

Communication no longer requires face-to-face meetings. From writing and reading to using computers, expanding and exhausting one’s communication possibilities relies more and more on applying skills one needs to

learn. Learning to apply them properly becomes a rite of passage with the increasing importance of communication technologies. The rate of communication has been on the rise. More and more information is transmitted and produced faster and faster, but the shelf life of information becomes more and more fragile. With rapid developments in technology, the rate of obsolescence or shelf-life of information and knowledge has become shorter and shorter. In such a scenario, the shelf-life of information affects the storage manner and storage period also (Geweke, 1989 and Mazzuchi et al, 2008).

In the case of higher education, information and information systems play a significant role in ensuring sustainability and ensuring the same through innovation developed through effective higher education. However, available literature on this aspect of higher education is scarce, especially so in the Indian context. Against this backdrop, the present study assumes significance.

2. Rationale of the Study

The following points highlight the rationale of the study.

- ◆ The increasing complexities of competition are giving rise to the necessity of having a repeated fresh set of information for educational processes, and appropriate systems are being employed to facilitate the same. The present study was undertaken in the context of the growing importance of effective education systems in India.
- ◆ Indian educational institutes experience an abundance of availability of general information at the same time, lack of specific details, which leads to confusion and difficulties in becoming skill-oriented. Keeping this contextual relevance in mind, the present study was undertaken.
- ◆ The researchers were curious to investigate how the practical aspects of higher education are interrelated to different challenges of data transformation faced in a fast-changing world order. Given the researchers' curiosity, the present empirical study was undertaken.

3. Objectives of the Study

Based on the research question, “ How are the challenges involved in transforming the data linked with the meaningfulness/effectiveness of higher education in India?”, the following were derived as the objectives of the study.

- ◆ To identify and categorise challenges involved in transforming the data.
- ◆ To identify the factors required in making higher education meaningful.
- ◆ To connect data-transforming challenges with the requirements of meaningful higher education.
- ◆ Based on the study, suggestions and recommendations will be listed.

4. Methodology

“Data Transformation Challenges” were obtained through the semi-structured interview schedules of 10 experts from diverse backgrounds. These semi-structured interview schedules included the quantification of

perceived challenges in terms of the degree of difficulty faced by the experts on a scale of 1 to 25.

The factors that will determine effective or meaningful higher education were arrived at using semi-structured interview schedules of 40 professionals associated with data transformation efforts and the higher educational sector. The responses were quantified on a scale of 1 to 25.

The linking of data transformation challenges and higher education effectiveness factors results in required focused areas for efforts. These focused areas for efforts, along with their present status, were identified based on semi-structured interview schedules of 40 professionals associated with data transformation efforts and the higher educational sector. The responses were quantified on a scale of 1 to 100.

The semi-structured interview schedules were based on the degree of concurrence with respect to impressions about key challenges/factors/required efforts for data transformation and increasing effectiveness in higher education.

The results of the study were collated and tabulated for further analysis.

5. The Results

The challenges faced while transforming the data into information were collected, collated, and categorised. In addition, the Mean, standard deviation and coefficient of variation of the perceived degree of difficulty for each of the individual challenges were calculated and tabulated, as shown in Table 1. It was observed that the coefficient of variation was higher than the threshold value of 0.25 for most of the cases and was consistently higher for the three competency-related challenges, viz., presence of hidden data, decoding different data collections and massive volume of data.

Regarding effective higher education, the research identified four factors. The ideal level of importance to be accorded and accorded level of significance along with their significant differences from t-tests were recorded as shown in Table 2. The differences between the ideal level and the actual level were significantly different for three requirements of effective higher education: tracking trends and adaptive methods, viz., identifying trends, collecting adaptive methods, and *improving adaptation*. For the remaining three factors of higher education, though there were differences, they were not found to be significant (Table 2).

Linkage between the data transformation challenges and the factors of higher education was collated in terms of percentage importance to be accorded—ideal and actual. These results were tabulated and presented as shown in Table 3. It is interesting to note that considerable focus has been put on developing individual-based data, and aptly, there is no significant difference in this broad area of focus.

6. Discussion

Information, in practice, exists in the hierarchy. Not all information is as helpful or necessary as other information. Some information moves from particularity and specificity to become generalised and abstract, thus becoming part of the generalised social knowledge. While doing so, whether the knowledge is that of a particular institute or of an entire culture over the period, it is not essential here. This information/knowledge could be said to have

a relatively long shelf-life. Other information is embodied in the material content of a commodity and lasts only as long as that particular commodity's useful life, whether materially or socially determined. Still, other information is valid only as information. It has a short or long shelf life depending on what it is (today's news versus a book on political history, for example). It is important to note here that the longer the shelf-life of information, the better the data transformation process.

A higher degree of co-efficient variation of perceived degree of difficulties in transforming the data into information for all the three categories of challenges, viz., time-related, complexity and competency, indicates the effect of individual differences and also the greater degree of effort required to overcome the habitual pattern of thinking that has set-in in the educational institutes. These results agree with the findings of earlier studies by De Landa (1991) in the context of deployment of information for strategic purposes and Cusumano. And Selby (1995) in the context of barriers faced in technology development within an organizational context.

Significant deviations between the actual and ideal importance accorded for the trends and adaptive methods related factor of higher education infers the lack of collective applications among the members of an organization while arriving at a decision in a service organization because of the need to carryout fire-fighting, and therefore the necessity to take instantaneous decisions.

The required focused efforts related results show that there is a high degree of disorder, especially in the skill, culture and soft-data-related information processes. This may be attributed to the confusion with respect to the macroeconomic forecasts that affect the planning and the consequent functioning of a service organisation like an educational institute. Further, the results of the qualitative interview schedules showed that divergence in expected material benefits was the leading cause for higher levels of required focused efforts.

7. Conclusions

The following were summarised as the conclusions of the study.

- The three categories of challenges in transforming the data into information identified were time-related, complexity-related and competency-related. Each of these three categories has a high degree of standard deviations and needs more effort for transformation.
- The research identifies four factors that would enhance the effectiveness of the Indian higher education system. They are linking theory with practice, linking concepts to culture, tracking trends and adaptive methods, and mastering internal components. Of these four factors, tracking trends and adaptive methods in the fast-changing world order have emerged as the significant one.
- The data transformation challenges were linked with factors of effectiveness of higher education and it was found that extensive data transformation is required to skill, connecting with the culture and group-based efforts.

8. Summary and Recommendations

Based on the study, the following suggestions and recommendations were listed

(i) Summary

- The present study may be replicated for various sub-stages of broad information processes, such as student

progress processing and effort analysis that are vital in the context of educational institutes.

- Since the quantum and direction of educational institutes vary between routine and non-routine spectrum, a comparative study between the two may be undertaken to ascertain the influence of data transformation efforts on the effectiveness of educational processes.
- Huge amount of data is a macro measure of disorder in an information system. Keeping this aspect of information systems in mind, studying the micro-level effects of data-related confusion on educational and skill-enhancing operations is necessary.

(ii) Recommendations

- Skill-oriented data and local contextual data need to be developed. Linking both will increase educational effectiveness by providing direction to the educational processes.
- Higher Education in India must work for effective and productive synergy between the hard and soft data since the latter influences the former. Each institute has to work on this aspect separately as well since the context of each institute is different in terms of physical infrastructure and intellectual capital available.
- Results of research indicate the need for timely feedback because they not only affect the information shelf-life but also lead to the meaningful continuation of information cycles necessary for meaningful deployment of information systems.

References

- [1] Cusumano, M. A., Selby, R. W. (1995). *Microsoft Secrets: How the World's Most Powerful Software Company Creates Technology, Shapes Markets, and Manages People*. The Free Press Publication.
- [2] De Landa, M. (1991). *War in the Age of Intelligent Machines*. Swerve Editions Publication.
- [3] Geweke, J. (1989). Bayesian Inference in Econometric Models Using Monte Carlo Integration. *Journal of Econometrica*, 57, 1317–1339.
- [4] Golan, A., Judge, G., Miller, D. (1996). *Maximum Entropy Econometrics: Robust Estimation with Limited Data*. John Wiley and Sons Publication.
- [5] Golan, A. (2001). A Simultaneous Estimation and Variable Selection Rule. *Journal of Econometrics*, 101(1), 165–193.
- [6] Golan, A., Maasoumi, E. (2008). Information Theoretic and Entropy Methods: An Overview. *Journal of Econometric Reviews*, 27, 317–328.
- [7] Grendár, M., Judge, G. (2008). Large-Deviations Theory and Empirical Estimator Choice. *Journal of Econometric Reviews*, 27, 513–525.

[8] Martins-Filho, C., Mishra, S., Ullah, A. (2008). A Class of Improved Parametrically Guided Nonparametric Regression Estimators. *Journal of Econometric Reviews*, 27, 542–573.

[9] Mazzuchi, T. A., Soofi, E. S., Soyer, R. (2008). Bayes Estimate and Inference for Entropy and Information Index of Fit. *Journal of Econometric Reviews*, 27, 428–456.

[10] Papalia, R. B. (2008). A Composite Generalized Cross-Entropy Formulation in Small Samples Estimation. *Econometric Reviews*, 27, 596–609.

Sl. No.	Category of the Challenge	Specific Challenge To Be Addressed	Perceived Degree of Difficulty		
			Mean	SD	CV
1	Time-Related	The rapidity of data flow	4.40	1.20	0.27*
		Time available	7.40	2.10	0.28*
		Changing patterns	19.80	3.80	0.19
2	Complexity Related	Multi-dimensional nature	4.40	1.30	0.29*
		Connection with past data	6.90	1.80	0.26*
		Multi-sources	10.90	2.70	0.25*
3	Competency Related	Presence of hidden data	6.20	2.10	0.34*
		Decoding different collections	12.40	4.20	0.34*
		Huge volume of data	17.30	5.40	0.31*

*Significant based on the conventional statistical practices

Table 1. Challenges for Data Transformation (Based on Results of Semi-Structured Interview Schedules of 10 Experts on a Scale of 1 to 25)

Sl. No.	Factor	Constituent Dimensions	Ideal and Actual Importance to be accorded on a Scale of 1 to 25		
			Ideal Importance	Actual Importance	Actual Vs Perceived t-statistics
1	Theory to Practice Link	Tracking Logical Track	5.10	4.40	1.18
		Tracking Changes	7.10	7.40	-1.06
		Developing Concepts	19.10	19.80	-1.44
2	Linking the Educational Concepts with the Culture	Track Cultural Components	5.00	4.40	1.65
		Educational Methods	8.10	6.90	1.79
		Concept - Culture Links	12.10	10.90	1.56

3	Tracking Trends and Adaptive Methods	Identifying Trends	11.40	6.20	2.88**
		Collecting Adaptive Methods	10.30	12.40	-2.45*
		Improving Adaptation	14.30	17.30	-2.67**
4	Mastering the Internal Components	Refining the Systems	5.10	4.50	1.11
		Individual Competencies Group Competencies	6.40	5.30	1.59
		Mastering the Internal Components	14.90	16.40	1.78

*Significant at 0.05 level of significance. **Significant at 0.01 level of significance.

Table 2. Factors Constituting Effective Higher Education (Based on the Results of Semi-Structured Interview Schedules of 40 Associated Professionals)

Sl. No.	Broad Areas of Focus	Associated Data Transformation Processes to be Addressed	Ideal and Actual Importance to be accorded on a Scale of 1 to 100 or percentage scale		
			%Actual Importance	% Ideal Importance	% Actual Vs % Ideal t-statistic
1	Developing Skill Oriented Concepts	Capturing Conceptual Data	45	85	2.18*
		Arriving at Contextual Data	35	85	3.06**
		Skill Levels Data	30	80	3.44**
2	Decoding Culturally Implied Data	Categorization of Data	52	82	3.65**
		Comparison of Data	50	80	5.79**
		Interpretation of Data	50	80	5.56**
3	Hard Data and Soft Data Linking for Tracking Trends	Generating Soft Data	60	90	2.88**
		Hard Data to Soft Data Link	46	86	2.45*
		Refining the Linkages	35	85	2.67**
4	Developing Individual Based Data	Capturing Individual Data	71	72	1.11
		Classifying the Data	48	51	1.59
		Capturing Actions	42	54	1.78
5	Developing Group Based Data	Degree of Repetitions	44	94	3.18**
		Degree of Goal Clarity	49	89	3.06**
		Number of Ideas Generated	44	84	4.44**

*Significant at 0.05 level of significance. **Significant at 0.01 level of significance.

Table 3. Focused Efforts To Overcome Data Transformation for Effective Higher Education (Based on the Survey of 40 Associated Professionals)