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ВАЗОРАТИ МАОРИФ ВА ИЛМИ
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OPEN DATA CHALLENGES THE CURRICULUM

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This article explores some of the dominating characteristics of open data expansion and in its impact on the curricula of business and economics programs in higher education institutions. The presented phenomena are based on findings by the author and elaborated during workshops in development project «Improving the competitiveness of economic graduates-economists based on the principles of the Bologna process» (ICEG) at Institute of Economy and Trade of the Tajik State University of Commerce (IET TSUC) Tajikistan. Data as competitive advantage, transformation of data to knowledge and selected aspects of open data and free software constitute the main perspectives of this article. Concluding remarks contain recommendations on how open data and data-analytics should be taken into account when higher education syllabi are developed.

Keywords: open data, curricula, transformation, syllabi

Introduction

Data-driven management has been one of the strongest trends in the field of management and leadership during the latest decade. Even though the workshops I conducted within the higher education development project *Improving the competitiveness of economic graduates-economists based on the principles of the Bologna process (ICEG)* were designated on improving the curriculum, syllabi and teaching methods in the scientific discipline of statistics at Institute of Economy and Trade of the Tajik State University of Commerce (IET TSUC) Tajikistan the discussions drifted inevitably towards diverse aspects of open data. This article summarizes the presentations and the discourse I had with my colleagues of the faculty of statistics at IET TSUC Tajikistan. First, we begin with recognizing the meaning

of data and data-driven management in modern globally competitive marketplace. The following chapter deals with the process of transforming data to knowledge and how organizations from both private and public sectors should manage this transformation. After that critical aspects of open data and its interoperability are assessed and opportunities of free and open-source data-analytics software are presented. Finally, based on the preceding chapters we propose some general recommendations on how open data and data-analytics should be included in the curricula of business and economics programs.

Data as competitive advantage for organizations

The likeness of the competition among companies on market and a war between battling troops is baffling. Companies fight over customers and armies fight over terrain. They acquire, allocate and deploy resources to defeat the opponent. The similarities continue further as intelligence operations are necessities in both environments and effect on the opponent is delivered in direct and indirect form.

This allegory starts from the thought that in business the marketplace is the terrain on which the battle takes place. When an army controls a piece of terrain it can also benefit from its resources. The ability to convert data into meaningful knowledge plays crucial role in coordinating the deployment of assets in the right place at the right time. Fortunately, the conditions of competition on a marketplace aren't as fierce as on a battlefield. However, one needs to recognize that the goal is the same: obliteration of the enemy to gain control over the terrain/marketplace. The idea of domination of a marketplace emerges from monopolistic benefits. When a company is in a monopoly position on a market it doesn't have to consider the competitors but in can set the price level solely based on the demand.

Every company needs to have a minimum level information production process because of the legal requirements. However, the process of converting data to information and eventually refining to knowledge offers all businesses opportunities to create a competitive advantage.

Strategy refers to a company's long term set of choices that aim to develop and protect the competitive advantage on marketplace. Business scholars have identified three levels of strategy: portfolio, business unit and functional strategy. In the past the competitive advantage of firm was based on concrete assets like access to raw material, manufacturing machinery, logistics and patents. The rise of information society has shifted the focus of strategy more towards the competence and agility of organization (Malhotra 2005, 11). Von Krogh et al. (2001, 436) predicted already at the beginning of the millennium that as firms base more and more of their business on the uniqueness and novelty of their knowledge process, an economic approach to knowledge will become inevitable for the future prosperity and survivability of most business organizations. The use of information technology should be integrated to within overall strategy of the organization using the technology or planning to use it, but on the other hand it should be considered also a potential source of competitive advantage (Hendriks 1998, 621). Eventually companies end up executing an information strategy which sets somewhere in the continuum between functional and competitive information strategy. Functional information strategy focuses on supporting the daily routine operations of the company while competitive information strategy seeks to create competitive advantage through creation of knowledge based on information. Functional information strategy relies on the use of internal data sources. For the competitive information strategy to work external data sources need to be integrated to the company information systems with a clear and regular process.

Transforming data to knowledge

Nonaka & Takeuchi (1995) state that new knowledge is created through synergistic relationship and interplay between tacit and explicit knowledge specifically through a four-step process of socialization, integration, and understanding/internalization. Information strategy should direct which internal and external data sources the organization chooses to use, how is the data collection, processing and analysis organized and who use the results of the analysis and how the results

are disseminated. Figure 1 presents a process of transforming data to knowledge. The aim is to portray proactive attitude towards data and knowledge as a source of company's competitive advantage.

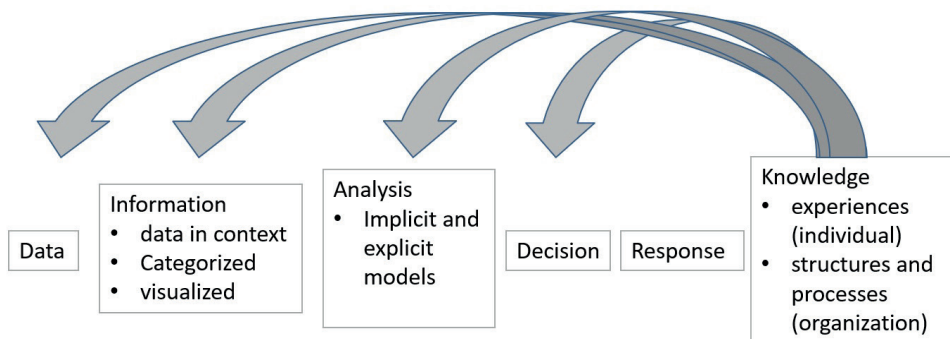


Figure 1 Data to Knowledge

Everything starts with data, especially when entrepreneur is starting his/her enterprise. In fact, nothing exists before idea, which is made up from data. When data is put into context, it becomes information. The ones and zeroes gain meaning. After that information is analyzed to support decision making. Decisions must be included in the organizational knowledge creation process. Without putting information in practical use in forms of decisions knowledge cannot be created. When knowledge is created systematically in organizations that knowledge reflects to the process. In an ideal case all the phases before the response will be evaluated and altered according to the response. As individuals we all apply this process automatically, sometimes consciously sometimes unconsciously. Namely, we learn from our mistakes and in rare cases from our success. From organizational perspective this process needs to be managed. Abdelkader and Ashill (2013, 422) sum that knowledge management is commonly defined as planned and structured approach to managing the creation, sharing harvesting and leveraging of knowledge to enhance company's ability, speed and effectiveness in delivering products or services for the benefit of clients. Further, knowledge management can create a competitive advantage only when its practices fit with the organizational context

(Chatzoudes et al. 2015, 1119).

Use and development of robust practical models in organizational decision-making requires a strategic belief in organizational knowledge as source of competitive advantage and systematic organization-wide processes that support knowledge creation. The transfer of knowledge is crucial part of knowledge strategy. Abdelkader and Ashill (2013, 434) report that explicit knowledge might dominate the type of knowledge transfer due to the ease in transmission as well as its ability to be easily assimilated, comprehended, and used.

Data supply, interoperability and quality

The raw data is produced by both public and private organizations and it has been opened to general use to varying extent. The trend of open data policies that permit and promote the reuse of data assets is strengthening. Statistics Department of United Nations promote following machine-readable formats, such as CSV, JSON and RDF (unstats.un.org/home). In addition to growing supply of open-access databases the number of free of charge data-analytics software enhances exploitation data in the management of organization. The various data related tools of Google form an easy starting point for a beginning data analyst. More advanced data-analysis, which is available free-of-charge, is statistical programming language R, which offers a wide range of data-analysis tools. GRASS represents a more field specific open-source data-analysis software, since focuses on the analysis of georeferenced data.

United Nations recognize global challenges to share, integrate and utilize the wealth of data that is available in today's digital era. These challenges arise from various reasons: 1. the divergent needs and capabilities of actors, 2. diverse processes, technologies, and standards, 3. fragmented data production and sharing systems (unstats.un.org/home). These challenges pose a threat to data interoperability, which enables an effective dissemination and deployment of open data. The global volume and variety of available data exceeds current

deployment rate greatly.

The root element of data quality lies in the first click i.e., who has entered the one piece of data the first time. Knowing the first click makes it a lot easier for the data users to evaluate its quality. Good quality datasets provide a description of the metadata. Metadata is data on data, and it should include: collector of data, variables included, relationship of variables and records, codifying of measurements, key entities, and time stamp.

Integrating open data and data-analytics to curriculum

Data-analytics of quantitative data encompasses on all sectors of modern society regardless of the size of the organization. Hence, data-analytics has expanded from its traditional fields of statistics and econometrics to all academic disciplines. Likewise, it is not only academics who deal with analyzing data but also people working in management and expert positions in all industries and public offices. From instruction perspective it is fundamental to educate students about the available databases in their related field of study. In fact, the relevant databases should be included as a topic in the syllabus of each separate course. An ideal learning outcome of this phase would be that the students will become capable of recognizing potential use cases for the data.

Once the students became aware of the available datasets, they need to get acquainted with data formats and records of the datasets, since they define the potential of data-analysis. The technical aspects like data retrieval and data-analytics software are of secondary importance because they are being renewed on a rapid pace. The data formats stay constant for longer periods of time. Understanding the meaning and properties of measurement scales creates the basis for any type of data-analysis. In a best-case scenario students gain this understanding when they are made responsible for collecting their own data for study purposes.

One of the key advances in today's data-analytics comes with

opportunity to merge data from different data sources. Students need to have understanding over criteria based on which the quality of the data is evaluated. Therefore, competence to check the data for mistakes, misrepresentations, and outliers. In addition, interoperability of data sources calls for skills to manipulate data in a such way merging of data becomes possible. Manipulation means modification of a certain field in data to a format that is identical in another dataset. For example, we might need to change record of data from the name of a neighborhood to ZIP-code of the respective neighborhood in order to be able to join the two datasets. Most common factors used for merging different dataset are geographical location and time, since they are present in majority of natural and social phenomena.

Naturally, data without analysis is meaningless. Analysis forms an essential element in data-to-knowledge process. In order to survive in modern-day data economy every college graduate should possess skills to carry out at least univariate analysis data. Frequencies, proportions, average and median make up a basic set of concepts that trained professionals should comprehend. Multivariate analysis belongs to toolbox of a more experienced manager or specialist. However, one should note that the expansion of available data and analysis tools have made it way easier to integrate different types of data-analytics exercises to syllabi of variety of courses.

Finally, as presented in the third part of this text the transformation of data to knowledge is not a separate entity in an organization, but it touches every function of it. In fact, the transformation of data to knowledge verges on management, which makes it an interest of employees in supervising positions. Therefore, every student graduating from university should have an idea of the significance of data within the context of management and development of organizations.

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ВЛИЯНИЕ ОТКРЫТЫХ ДАННЫХ НА УЧЕБНЫЕ ПЛАНЫ

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В статье исследуются некоторые из доминирующих характеристик расширения открытых данных и их влияние на учебные планы программ по бизнесу и экономике в высших учебных заведениях. Представленные явления основаны на выводах автора и разработаны в ходе семинаров в рамках проекта «Повыше-

ние конкурентоспособности выпускников-экономистов на основе принципов Болонского процесса (ICEG) в Институте экономики и торговли Таджикского государственного университета коммерции (ИЭТ ТГУК) Таджикистана. Данные как конкурентное преимущество, переход данных в знания и отдельные аспекты открытых данных и бесплатного программного обеспечения являются ключевыми вопросами данной статьи. Заключительная часть содержит рекомендации о том, как следует учитывать открытые данные и аналитику данных при разработке учебных программ в высшеобразовательных учреждениях.

Ключевые слова: *открытые данные, учебные программы, превращение (переход), учебный план.*