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THE RO THEORY, DISCOVERY OF BUI, AND IS: BEGINNING OF THEORETICAL FOUNDATIONS

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1. INTRODUCTION

This brief, but in-depth, analysis and propositions have been an ambitious endeavor of the author to review, analyze, understand, obtain and discover scientifically-based foundations for the organizational theories Dr. Elliott Jaques has put forward during the past fifty-five years of research. This endeavor has lasted for over two years, having started with the author's interest to work on a doctoral dissertation based on the Requisite Organization theory at the School of Business and Public Management of The George Washington University, a well-known school in Washington, DC that has allowed bizarre, original, and non-traditional ideas to be investigated and worked on for doctoral theses.

The author spent first year and a half studying the scientific principles and foundations for the Requisite Organization theory as without an accurate understanding of the logic, data, and propositions, it would have been impossible to offer a respectable summary of critiques, and during the past six months, concurrently, the author has read and re-read varied sources, such as books, articles, including personal interviews with a variety of gurus and experts in the field of organizational sciences in an attempt to present a most accurate summary of critiques of the theory to the present day.

The author is eternally grateful to Dr. Elliott Jaques, who personally tutored and taught the deepest foundations for the Requisite Organization theory (and other theories as well) – Dr. Jaques' phone rang several times a week, sometimes a day, for the past two years, with the author's putting his best efforts, though not always best, into understanding what is there to critique based on testable scientific principles, until Dr. Jaques' passing away on March 8, 2003. Dr. Jaques spent an immeasurable amount of time with the author; thus, a critic of this paper may well accuse the author of being biased, but it is for the intelligent reader to judge this paper and its intentions, ideally having read the paper.

The author is tremendously thankful to Dr. Jaques for his schooling, which, if it were judged by Dr. Jaques' consulting hours, would have run the author several times the cost

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of the entire Ph.D. program, which is quite expensive as George Washington is a private institution. Nonetheless, the author's intention is to be fair to the science, scientific method and testable scientific principles, which were one of the main lessons Dr. Jaques instructed; thus, this article, the author hopes, is a fair and accurate representation of the state of the current thought of organizational theorists regarding the Requisite Organization theory, previously known as Stratified Systems Theory, and its implications for the development of the IS theory.

2. WHAT CONSTITUTES THE REQUISITE ORGANIZATION THEORY

*"A theory is good theory if it satisfies two requirements: It must accurately describe a large class of observations on the basis of a model that contains only a few arbitrary elements, and it must make definitive predictions about the results of future observations."*²

(Stephen W. Hawking)

The Requisite Organization theory is a good theory according to the definition and argument put forth by Stephen Hawking because it precisely describes the managerial organizations worldwide and makes definitive predictions about future developments of these organizations and their behavior, thus, making the theory testable and refutable as a result of comparison of predicted and later-on observed behavior.

The Requisite Organization theory³ was previously known by another name, Stratified Systems Theory (SST), which itself was derived and based on the General Theory of Bureaucracy⁴, also developed by Dr. Elliott Jaques in the late 70s.

The General Theory of Bureaucracy and Stratified Systems Theory have both been re-thought, re-worked and "re-versioned" into the new theory, from now on to be called the Requisite Organization Theory⁵, as depicted on the following figure:

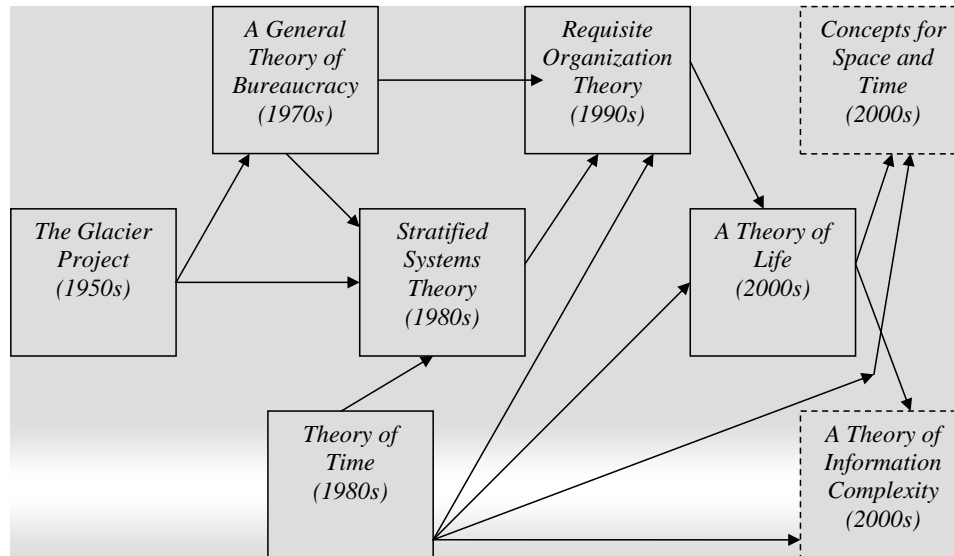
² Hawking, Stephen W. (1988). A Brief History of Time: From the Big Bang to Black Holes. New York, NY: Bantam Books.

³ Jaques, Elliott (1996). Requisite Organization: A Total System for Effective Managerial Organization and Managerial Leadership for the 21st Century. Arlington, Virginia: Cason Hall & Co..

⁴ Jaques, Elliott (1976). A General Theory of Bureaucracy. London, UK: Heinemann Educational Books.

⁵ This is an important fact to state regarding these theories, as there is a wide confusion which is the present theory, and whether they are different or same. So, in order to prevent the reader from being confused, the author thought it would be important to explain the evolution and present state of Dr. Elliott Jaques theories.

Figure 1. Theories' Historical Development.



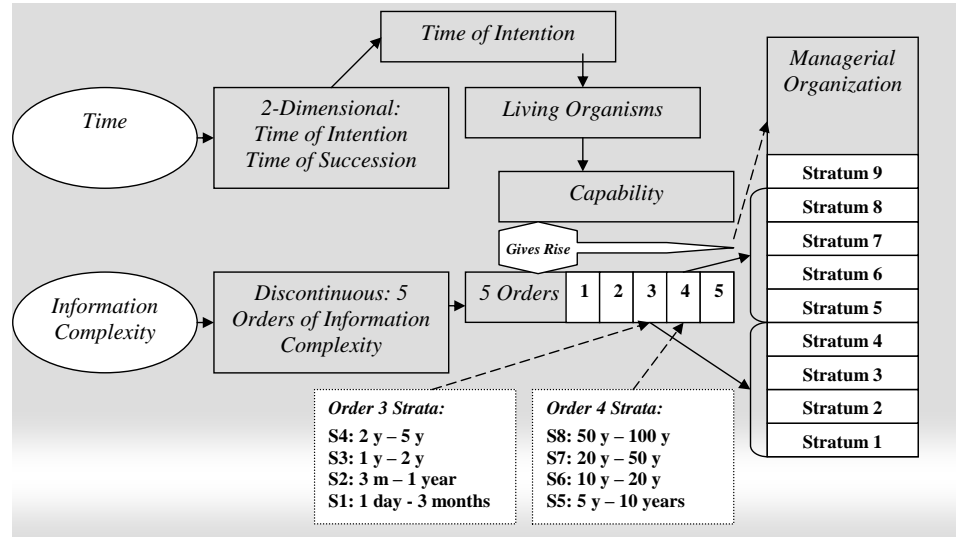
As evident from the figure above, Dr. Elliott Jaques has developed several theories addressing different phenomena observed. This paper mostly concentrates on the foundations for the Requisite Organization theory, and the preceding theories' concepts included in the present organizational theory. This paper, though, does exclude the discussion of foundations for the Theory of Life, Concepts for Information Complexity, Time and Space; however, some of the concepts for the latter theories are included and discussed in the paper as they relate to the Jaques organizational theory, the Requisite Organization theory, to be called the RO theory in this paper. Also, in the figure, the boxes with uninterrupted filled lines imply a completed theory, and the boxes with interrupted lines imply unfinished theories.⁶

According to Stephen Hawking, who is one of the world's leading theoretical physicists today, a good theory should contain only on a few arbitrary elements. Indeed, the Requisite Organization theory is founded on only two fundamental concepts: time and information complexity.

The following figure depicts how these two basic elements, time and information complexity, give rise to the RO theory.

⁶ The development of the theories of Information Complexity and Time and Space, has unfortunately been interrupted by the sudden death of Dr. Elliott Jaques on Saturday, March 8, 2003 (at the age of 86).

Figure 2. The RO Theory's Foundations.



The first fundamental proposition and assumption founded on data is that time is two-dimensional, consisting of the time of succession (the normal passing clock-time) and time of intention – to achieve what by when into the future. Intentionality is the main fundamental characteristic that gives rise to living organisms, and distinguishes the physical objects from the living organisms. The premise is that the regular physical objects do not intend to achieve “what by when” – they instead dwell in the four-dimensional world, the three space coordinates and one of time, the time of the clock (succession). All living organisms, instead, reside in the five-dimensional world, same three space coordinates, but two time dimensions, the time of succession (clock) and the time of intention – all living organisms are “going” somewhere – trying to achieve, as Dr. Jaques would say, “what by when” – certain desired results by a certain deadline.

To achieve certain desired results by a definitive deadline requires that the living organism juggles the complexity of information to make decisions, such as which road to take out of the many options available. The information that the living organism receives is coming in from the outside world dynamically, in always changing states, movements and directions. Each living organism (and species) processes this dynamically-arriving information based on the internal capability of the organism to deal with the information complexity. The capability of the living organism is defined by its ability to plan goals into the longest time (of intention) into the future, such as get food within an hour, buy a house within a year, and so on – these times vary greatly with the species’ evolutionary development.

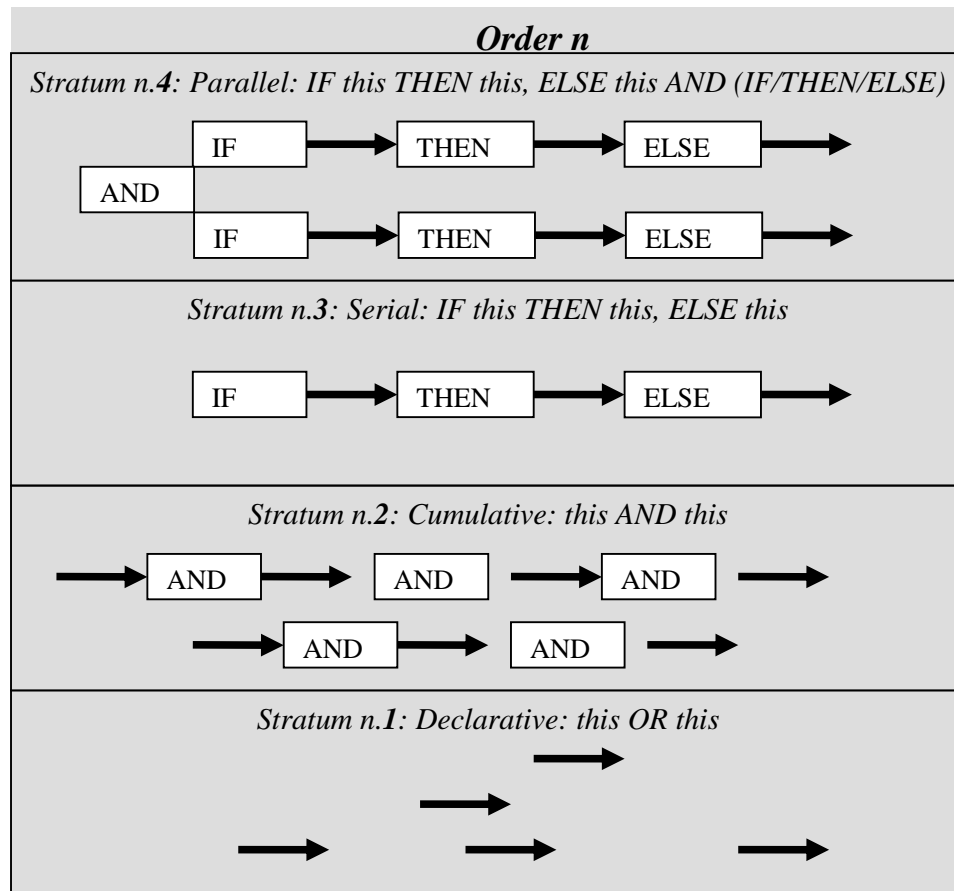
Humans are presently the only known species⁷ who have the highest capability to plan events into the longest possible future, to deal with the changing worldly events. All other known species mature within only the first order of information complexity; only

⁷ All other known species mature within only the first order of information complexity; only humans have spread across the five orders of complexity of information.

humans have spread across the five orders of complexity of information⁸. Most human adults operate in Order 3 information complexity, which means that they are capable to plan events between 1 day and 5 years into the future. Extraordinary humans reside in the next order of capability, Order 4, and are capable of executing goals lasting between 5 to 100 years into the future. The RO theory's main proposition is that the discontinuous capability of humans has given rise to the discontinuous levels of Managerial Organizations.

Furthermore, there are four discontinuous and objectively noticeable strata within each order of information complexity. So far the evidence (data) has shown that all living organisms, not depending on the species, deal in distinctly four different ways with the rising complexity of information in each order, to be recursively repeated in the next order: in declarative, cumulative, serial and parallel modes, as depicted in the following figure:

Figure 3. Modes of Information Processing in Each Order.



⁸ Jaques, Elliott (2002). *Orders of Complexity of Information and the Worlds We Construct*. Gloucester, MA: Unpublished Manuscript.

These strata are discontinuous, with the species maturing from the lowest stratum to the highest, depending on the internal growth of capability, which so far has not been found to be dependent on any social factor, such as education, status in the society, and so on. The vast majority of human adults mature to Order 3, and lesser numbers to Order 4, still being differentiated by the in-born (as the data presently shows) capability. The humans are the only known species to have spread through several orders of information complexity⁹, thus, creating the managerial type of organization consisting of roles at different strata to achieve objectives, largely to organize the members of the species to a useful and productive endeavor for the survival of the species – most work in human societies is organized in various types of managerial hierarchies, in which a member derives a living from filling a role in this type of an organization. The managerial organization consists of roles, and according to the RO theory, each role should be a stratum apart, the manager's role one stratum higher than the subordinates, where each person's capability matches the role's stratum.

Each role can be measured precisely using the time-span of the role measuring instrument, obtaining the ratio-scale data for the size (level) of the role. There is no precise measuring instrument to measure each person's capability, though several evaluative methods have been developed by Jaques and Cason¹⁰. The methods allow evaluating the capability of a human to determine which stratum the member has matured to, and the high, middle or low level within the stratum. Furthermore, the data collected by Jaques shows that capability matures in stable and predictable patterns based on the in-born acceleration rate and the time of succession, thus, predictable at any time of succession into the future when the person would mature from the lower stratum to the next higher one, and if the acceleration rate is high enough, determines the highest order of information complexity and the highest stratum within this order the person can mature to given s/he lives up/survives to a certain age¹¹.

Having identified the main cause for the rise of the Managerial Organization (discontinuous capability of humans to deal with information complexity), Dr. Jaques identified major parts and relationships between the various parts of this type of an organization, such as manager, subordinate, roles, authorities, accountabilities, and others¹².

⁹ Jaques, Elliott (2002). The Life and Behavior of Living Organisms: a General Theory. Westport, CT: Praeger Publishers.

¹⁰ Jaques, Elliott & Cason, Kathryn (1994). Human Capability. Rockville, MD: Cason Hall.

¹¹ The current predictability rates do not account for the time of succession differentials noticeable when traveling at high velocities, such as the speed of light; gravitational effects are also discounted, and so on; these effects should be accounted in the further development of the RO theory, but at the present time all these high-velocity/gravitational variables play an unnoticeable role, as presently evidenced by the data collected by Jaques.

¹² Jaques, Elliott (2002). The Psychological Foundations of Managerial Systems: A General Systems Approach to Consulting Psychology. San Antonio, TX: Midwinter Conference of the Society of Consulting Psychology.

3. DISCOVERY OF BASIC UNIT OF INFORMATION

Dr. Jaques, in his unpublished paper “Orders of Complexity of Information and the Worlds We Construct”¹³ has identified and elaborated the differences between the orders of information complexity, and how the living organisms handle complexity. His paper preludes to a major discovery of a basic unit of information, which Dr. Jaques was very excited to share with the author in April 2002. The basic unit of information is a tangible, something with can be pointed to that objectively exists. For example, the statement, “pick up this stick” (assuming that there is a stick lying on a floor), contains two basic units of information (2 BUI)¹⁴:

pick up → 1 BUI
 this stick → 1 BUI

The statement “pick up this stick”¹⁵ is communicated to the reader via the written language, this essay, which would be communicated among the species of the first order of complexity of information via signaling¹⁶. Thus, humans physically manipulate various tangible things via different orders of information complexity; the greater the capability of a member is, the greater s/he influences the tangibles from the abstract levels of information, intangibles, which are a collection of tangibles (such as, trash) – second order, related systems of intangibles – third order, continuously changing intangibles – fourth order, and related systems of continuously changing intangibles – fifth order, based on the matured capability¹⁷.

4. WHY THE REQUISITE ORGANIZATION THEORY IS A GOOD THEORY

The RO theory, according to Stephen Hawking’s definition, complies with the requirement of being a ‘good’ theory. Besides having only two arbitrary elements (time of intention and complexity of information), the RO theory makes definitive predictions for all Managerial Organizations, which could be tested objectively and scientifically by anyone interested. Some of the predictions include:

If the CEO’s role is stratum n , and the incoming CEO’s capability is $n-m$ (one or more strata below), the company will suffer dramatically – there will be an outflow of people, the new CEO might possibly be fired, or the company would be reduced in size to

¹³ Jaques, Elliott (2002). Orders of Complexity of Information and the Worlds We Construct. Gloucester, MA: Unpublished Manuscript.

¹⁴ The discovery of the basic unit of information was made by Dr. Elliott Jaques in April 2002; Dr. Jaques has shared this discovery with the author of this paper when they both met in Washington, DC, in April 2002.

¹⁵ The reason that the author has chosen the statement “pick up this stick” is personally very special to the author – in the early morning (9 AM) in a Washington hotel’s room, Dr. Elliott Jaques tried to teach the author his latest discovery, and to convey it, he would throw his walking stick on the floor asking the author to pick it up and count the number of BUIs, eventually quite irritably as the author was slow picking up the ideas.

¹⁶ Jaques, Elliott (2002). The Life and Behavior of Living Organisms: a General Theory. Westport, CT: Praeger Publishers.

¹⁷ Even though the BUI is discovered, and can objectively be pointed to, the sudden death of Dr. Elliott Jaques has stopped his research into the nature of information complexity, and finding the measuring instrument to measure the complexity with ratio scale values.

match the capability of the new CEO, such as instead of being the stratum n company, it would become $n-m$. Furthermore, a market test could be constructed: if the new CEO's capability is a stratum or more higher than the previous, the market value of the company will rise, and the shares of stock will rise in value and price, and the opposite would happen if the new CEO's capability is below the requirement of the role.

Other predictions include that if the manager's role is one stratum higher than the subordinate's, and the capabilities of manager and subordinate match the complexities of their roles (the level of work measured by the time-span measuring instrument), this would constitute an effective manager-subordinate relationship, with both, the manager and subordinate reporting feeling just right towards their working relationship¹⁸. There are a wide variety of other tests that could be invented by intelligent users of the RO theory to test logical corollaries of the RO theory, such as role-based pay, and many others.

Furthermore, the RO theory is ethical, respectful and humane treating humans in the society. The theory explains why all humans are not born equal based on their in-born capability, which is objectively and accurately observable, thus, preventing discrimination based on "common-sense-half-truths," and particularly stops race, gender, social status, sexual-orientation, and other socially invented characteristics to differentiate and restrict certain persons' access to societal resources and working roles proper for their current developed capability. Thus, in order to qualify for a certain organizational role, all a person would have to demonstrate would be the skills and knowledge required, and capability matching the complexity of the role, rather than intuitive feelings of the interviewers whether or not the interviewee would work out based on non-stated criteria of their opinions, which are often inaccurate, demoralizing and destructive, especially when the "wrong person" enters the "wrong role" – both, organization and people suffer, including the person whose capability does not match the role s/he is put in.

Thus, in summary, the RO theory is a scientific theory, based on very few arbitrary elements, with definitive boundaries and predictions, which are testable objectively. Furthermore, the RO theory allows ratio-scale measurements of the size of the role (level of work) via the time-span measurement instrument¹⁹ and an accurate objective evaluation of the capability of the member of the human species²⁰. The theory has a univocal vocabulary, thus, allowing the discussion of the same phenomenon using the same terminology, and overall, is refutable if it does not withstand the empirical tests.

5. GORMAN'S DATA ELEMENT

Michael Gorman, one of the leading database theorists and practitioners at the present time, has been developing methodology for large enterprise data sharing, attempting to resolve the problem that large government departments and large corporations have many different databases, with business- and mission-critical data, but same information maybe and generally is saved in different fields with different names,

¹⁸ This area of the RO theory is presently being tested by the author in an attempt to validate and possibly advance the RO theory in elaborating further the nature of the manager-subordinate relationship.

¹⁹ Jaques, Elliott (1964). Time-Span Measurement Handbook.: Cason Hall.

²⁰ Jaques, Elliott & Cason, Kathryn (1994). Human Capability. Rockville, MD: Cason Hall.

different datatypes, and furthermore with different table²¹ structures, and different relationships between tables. In his article, “A Column By Any Other Name Is Not a Data Element,” Gorman (2002)²² states the problem and attempts to differentiate and identify the actual data elements, which are represented in columns of a relation. Gorman (2002) defines data elements as “context independent business fact semantic templates.” He then proposes to use a CASE²³ tool to identify the business facts, and draw columns for already identified data elements, to ensure that information could be shared later among a wide variety of databases an enterprise employs (also using a variety of different DBMSs).

The CASE tool that Gorman promotes is the one that his company, Whitemarsh Information Systems, has developed – the tool is called “Metabase.” This tool is based on Gorman’s methodology to identify and abstract to and from different levels of information, identify data elements, and use the repository to generate SQL DDL and an actual application using another GUI CASE tool, Clarion, which generates the application from a SQL dictionary.

The problem with Gorman’s approach, even though it is the most precise, elegant and creative methodology offered to the public at the present time, is that it is not based on science. Gorman’ genius has understood that different types of meta data reside at different levels of abstraction. He identifies the following four layers in developing a database application:²⁴

| | |
|---|---|
| <i>Specified Context Data Model Layer</i> | → analogous to a high level conceptual design. |
| <i>Implemented Technology Schema Layer</i> | → 3 rd Normal form ERD logical data model. |
| <i>Operational Vendor DBMS Schema Layer</i> | → analogous to a physical data model. |
| <i>Application View Schema Layer</i> | → business application view schemas in conformance with common business language terms. |

Unfortunately these levels of abstraction are arbitrary and are not based on actually existent orders of abstractions discovered by Dr. Elliott Jaques, and furthermore, it is not clear how Gorman’s data element is related to the Basic Unit of Information, the tangible, discovered by Jaques in 2002. It is the premise of this paper that any methodology will fail if it is not based on a solid theory, and Gorman’s lacks the fundamental theory to justify the abstracting data elements to and from the levels Gorman has identified; they are arbitrary and imprecise, unless found to be related to the science of information complexity and the BUI.

²¹ The author is describing the problem as it relates to the Relational Databases, but same conclusions could be carried over to other types of databases.

²² Gorman, Michael (2002). A Column by Any Other Name Is Not A Data Element. Bowie, MD: Whitemarsh Information Systems Corporation.

²³ CASE stands for Computer-Aided Software Engineering.

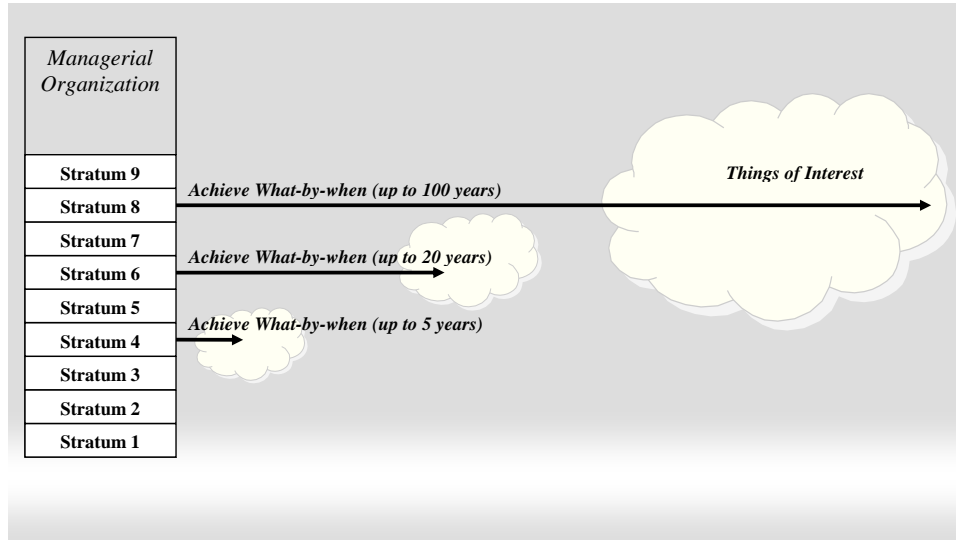
²⁴ Gorman, Michael (2003). A Metadata Architecture For DoD Data Management. Bowie, MD: Whitemarsh Information Systems Corporation.

6. ABSTRACTION-BASED DATA MODELING TECHNIQUE AND NATURALLY OCCURRING INTENTIONAL RELATIONSHIPS

A possible (and likely the only one) solution to reconcile Gorman’s approach and the RO theory is to map properly the BUI, data elements and other ‘things of interest’ to the Orders of Information Complexity discussed earlier in this paper. Databases describe naturally occurring intentional relationships between things of interest in a certain domain. Each relationship is a result of an intention, a business purpose encompassing the events of interest so that to gain efficiency, accessibility and other benefits of information readily available via the database technology. The organizational purpose originates in one of the higher-strata of information complexity, and relates information at different levels of information complexity, starting with abstract information types (higher abstraction level) and ending with tangibles (actual point-able data recorded in databases).

The following figure describes the intentionality rising from Managerial Organizations:

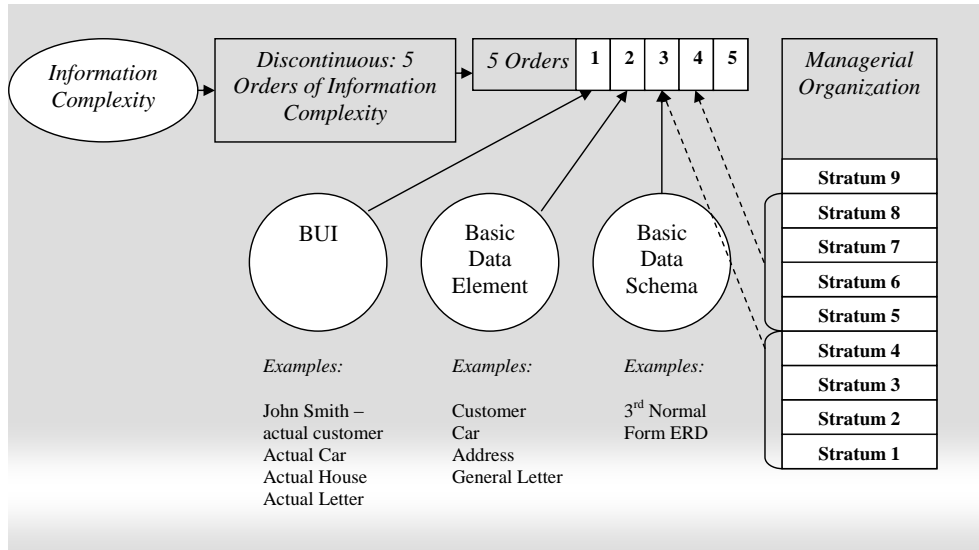
Figure 4. Intentionality.



The “Things of Interests” (in the figure above) comprise tangible as well as more abstract achievement points, creating an explicit set of specific things the organization needs to account for, while achieving its goals. For example, an organization may need to save the customer information, billing information, and all types of other things the company needs to conduct its business and deliver on its long-term (often called strategic) goals.

The following mappings of Jaques’ BUI and Gorman’s Data Element this paper offers pending comments and critiques from peers:

Figure 5. Relating Basic Unit of Information and Basic Data Element.



The 1st order of Complexity of Information, according to Jaques, consists of manipulation of tangible information – each tangible is called a Basic Unit of Information, including both, nouns and verbs. The nouns are BUI foundations for Gorman’s 2nd Order of Complexity of Information, Basic Data Element, which in the 3rd Order of Complexity of Information becomes a Basic Data Schema, or 3rd Normal Form ERD. Similarly, verb BUIs could be promoted to classes of behavior (2nd Order of Complexity of Information) and collection of classes of behavior (3rd Order of Complexity of Information), as a beginning for theoretical foundations for the behavior object-modeling, and a new approach to modeling the business model. Gorman’s methodology accomplishes and includes hierarchical relationships among different abstract types of information to be mapped and used throughout developing the database model, thus, more accurately describing the naturally-occurring relationships in a computer model, preserving the hierarchy (relationships) between the abstract levels as well as relationships on the same level of complexity (relational design), giving a possible theoretical foundation to the abstraction-based data modeling technique that Gorman has developed. The abstraction-based data modeling technique²⁵ allows accurate mapping of things of interest among various abstract levels of information complexity an organization needs to record in the database(s).

²⁵ The abstraction-based data modeling technique has been developed by Michael Gorman, and is still in development pending the author’s attempt to incorporate it into the scientific research on information complexity offered by Dr. Elliott Jaques, thus, attempting to create a scientific theoretical foundation for the abstraction -based data modeling.

7. COMPLEXITY DIRECTIONS

Complexity is one of the problems-to-be-resolved, remaining a highly obscure and difficult issue to tackle. Presently, there does not exist a measuring instrument to measure the complexity of the system precisely – it just hasn't been invented yet! The author strongly believes that a successful IS theory must include a means to measure complexity of information for its proper modeling; so that a precise and accurate data model could be designed based on the scientific principles of the IS theory.

Dr. Jaques has given some insights into the nature of complexity. He believed that complexity depends on the number of variables and the rate of their occurrence. This paper additionally demonstrates that possibly identification BUI, data elements, time of intention and time of succession may possibly lead to discovering a measuring instrument to measure the complexity of intentional endeavors; thus, the heading of this section hints that complexity is directional, based on the time of intention.

8. SUMMARY AND CONCLUSION

This paper discussed the RO theory, which is the only testable and scientific theory in existence at the present time regarding the Managerial Organization, the discovery of the Basic Unit of Information, Gorman's methodology to enterprise data sharing and data element (abstraction-based data modeling technique), in an attempt to begin the discussion and formulation of testable principles for the IS theory of tomorrow, which must be based on testable and scientific principles. Gorman has offered a very creative idea for a data element and its use in propagation through various levels of abstraction to design, develop, and share data among various enterprise database applications. His method is called abstraction-based data modeling technique. Further development of this methodology is needed to describe the propagation of BUIs to Data Elements through the Orders of Information Complexity (abstraction levels). Furthermore, Dr. Elliott Jaques' research into the nature of information complexity allows a scientific mapping between the Basic Unit of Information, Data Element, and precise mapping between classes of information in different orders of information complexity. Thus, the combination of the RO theory with the abstraction-based data modeling methodology offers new insights into the nature of complexity, and development of a scientific IS theory of tomorrow.

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²⁶ For a complete list of references, please contact the author at sergey@gwu.edu. If you would like to reach the author by mail, please write to Sergey Ivanov, 20101 Academic Way, Suite 321, Ashburn, VA 20147, USA.