

INFORMATION INTEGRITY – CONCEPT AND DEFINITION

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Information Integrity/Integrity Information System/Management Information System

Course Lecture (s) # 6-7

2006-2007

LECTURE # 6-7:
INFORMATION INTEGRITY –
CONCEPT AND DEFINITION

OVERVIEW - 1

- Recall from Lecture # 6
- A Corollary
- Increasing importance of accounting information –
Alternate Explanation
- Efficient Resource Allocation Requires Competition
- First Requirement of Competition
- Second Requirement of Competition
- Need for Accounting Information to maintain competition

OVERVIEW - 2

- A Corollary: *IS* Requirement for Sustainable Complexity
- Need for A Measure “ I_1 ”
- Need for “ I_2 ” and “ I_3 ”
- Increased importance of “ I_1 ”
- $I*I$: The First Statement
- An Elaboration
- Exercises

RECALL FROM LECTURE # 5

- In Lecture # 5, we saw that educational organizations of any type, i.e., hierarchical or horizontal, i.e., industry need focused, utilize complex examination information systems to achieve education business efficiencies.
- As a result, examination information, in particular, takes on increased importance as human resource based society develops.

A COROLLARY

- Stated generically, in an environment (market) based organization – a system – an (identified) specialized information (equivalence of *examination marks* in recruitment market mechanism or more significantly of *money* variable under a market price mechanism) takes on increased importance as the environment develops (by increasing its (i.e., environment's) complexity).
- **An Exercise:** For a problem area of interest, develop a case study in support of above thesis.

INCREASING IMPORTANCE OF ACCOUNTING INFORMATION – ALTERNATE EXPLANATION

- The argument that accounting information takes on increased importance as economic society develops (in complexity) can also be supported by recourse to elementary price theory and a focus on the role of capital markets in a market economy.
- The central point is that accounting information is **useful/usable** part of the market mechanism for resource allocation (which is perhaps a single most important organizational requirement) on two levels.

EFFICIENT RESOURCE ALLOCATION REQUIRES COMPETITION

- Efficient resource allocations by means of market pricing, in any product or factor market, requires competition.
- Competition requires, as necessary conditions at least, two things:
 - Information about market imbalances that indicate possible business opportunities, and
 - Access to capital to exploit them.

FIRST REQUIREMENT OF COMPETITION

- One very important source of information about possible market imbalances is accounting information about the players in the market.
 - Signals about “excessive” profits are one of the most useful contributors towards maintaining competition, but so is information about the cost and capital structure of firms that operate in the markets.
- *Here every line in the financial statements, not only the bottom one, is important.*

SECOND REQUIREMENT OF COMPETITION

- The other condition for competition in product and factor markets, access to capital, requires a working mechanism for allocating capital.
- *Here, accounting information is again more important, if capital is to be allocated to the projects where the need is greatest, i.e., which are the most profitable.*

NEED FOR ACCOUNTING INFORMATION TO MAINTAIN COMPETITION

- This holds regardless of whether this is done by a firm or by a market mechanism – the point being that in a money-based market economy accounting information is needed in order to maintain competition and pricing in *both* capital and other markets.

A COROLLARY: *IS* Requirement for Sustainable Complexity

- Stated generically, the efficiency, degree of specialization and sustainable complexity of environment based (responsive) systems, their sub-systems and their components are on rise – these things go hand in hand.
- This trend is particularly clear when we consider information systems at any level.

NEED FOR A MEASURE “I₁”- 1

- In order to function easily, the environment based (read as “responsive”) mechanism requires a common denominator, a measure or an aggregate: an identified information “I₁”.
 - Information “I₁” should be in a form such that it makes particularly **useful/usable** in the context of an environment responsive mechanism.

NEED FOR A MEASURE “ I_1 ”- 2

- Conversely, as systems face environments (markets) where system products and production factors – and they (i.e., systems themselves) - are valued in terms of information “ I_1 ”, they (systems) will naturally tend to orientate and develop their intra-system control systems so that the processing, i.e., *use* of information “ I_1 ” as a measure will minimize transaction and contracting costs.

NEED FOR “I₂” AND “I₃”

- Further, information “I₁” should also play a **useful/usable** role in allocating resources at two levels.
- Specifically, efficient resource allocation in any product or factor market requires competition.
- Competition requires as necessary conditions originating at least two types of information:
 - (a) information “I₂”, on environment (market) imbalances indicating opportunities (i.e., system performance improvement opportunities or business opportunities), and
 - (b) information “I₃”, constituting knowledge of working mechanism for resource allocation.

INCREASED IMPORTANCE OF “I₁”

- With environment (market) valuing the system products, production factors and system itself in terms of information “I₁”, it (i.e., information “I₁”) about the players in the environment (read market) would turn out to be an important source for information “I₂” and “I₃”.
- This makes information [(I) = {I₁, I₂, I₃}], and particularly information {I₁} of increased importance as environmental (read informational) complexity increases.

I*I : THE FIRST STATEMENT-1

- For the accounting information system:
 - In a money-based market economy accounting information is needed in order to maintain competition.
 - If the organizational accounting system is to minimize transaction or contracting costs, then costs associated with originating and applying (i.e., processing) accounting information and loss due to remaining information asymmetries should be minimum.

I*I : THE FIRST STATEMENT-2

- Further, if information about market imbalances is to be correct, then every line in the accounting statements, *not only the bottom one*, should be correct.
- Also, if capital (resources) are is to be allocated to the projects (opportunities), which are most profitable, *then also* the accounting information should be correct.

I*I : THE FIRST STATEMENT-3

- Understandably, accounting information with integrity will lead to correct, i.e., integrity information about market imbalances and about allocation of capital.
- From above it follows that for business competitive advantage, accounting information must be correct, i.e., with integrity.

I*I : THE FIRST STATEMENT-4

- For a generic information system:
 - An environment based (read as “responsive”) mechanism requires originating information in the form of a common denominator, a measure or an aggregate, which is an identified information “ I_1 ”, in order to maintain competition.

I*I : THE FIRST STATEMENT-5

- If information system is to minimize transaction or contracting (i.e., comparing and selection) costs, then costs associated with originating and applying (i.e., processing) information “ I_1 ” and loss due to incorrect origination of “ I_1 ” should be minimum.

I*I : THE FIRST STATEMENT-6

- Further, information (I_2), on market imbalances indicating (business) opportunities should be correct.
- Also, information (I_3) constituting knowledge of working mechanisms for resource allocation should be correct.

I*I : THE FIRST STATEMENT-7

- Given that information (I_2) and (I_3) will depend upon information (I_1), understandably, it is the *correct* origination of (I_1), that is information (I_1) with integrity, that will lead to:
 - (a) *correct* origination of information (I_2) and (I_3), i. e., information (I_2) and (I_3) with integrity, and
 - (b) processing of information (I_1) by minimizing transaction and contracting, i.e., comparing and selection or information decision-making costs.

I*I : THE FIRST STATEMENT-8

- From above it follows that for (business) competitive advantage, information $[\{I\}=\{I_1,I_2,I_3\}]$, and particularly information (I_1) , must be *correct*, i.e., with integrity.
- Stated differently, it is by controlling I*I of information (I), and particularly that (integrity) of information (I_1) , that the competitive advantage is achieved.

I*I DEFINATION

- It is easy to understand importance of information [$\{I\}=\{I_1,I_2,I_3\}$], and particularly information (I_1), but what, exactly, is Information Integrity (I*I)?
- In the progress of the course, a definition will be advanced, where the integrity of a set of information is defined as the inverse amount of distortion and noise present.
- I*I is thus concerned with the *correctness* and *exactness* aspects of the information.

...AN ELABORATION-1

- Information Integrity is dependability and trustworthiness of information system and information there from.
- With the advent of computer technology the importance of information has increased.
- Mainly two disciplines have addresses problems arising out of this, namely, computer science and accounting.

...AN ELABORATION-2

- In computer science, Information Integrity is seen as the problem of Data Integrity and dealt with, on a technological level, mainly as a sub-field of computer security. Other sub-fields are confidentiality and privacy.

...AN ELABORATION-3

- In discipline of accounting issues of Information Integrity are seen from the angle of auditing and internal control.
- Thus once again I*I is seen as sub-field of security, other sub-fields, however, being confidentiality and availability.

...AN ELABORATION-4

- As a general point:
 - The practice is the more efficient the available information technology, the more is its use and, consequently, more reliance and dependence on it.
 - Assumption is more efficient information technology should result in, among other things, a greater concern (benefit) with I^*I , not least accounting information integrity.
 - It is common to hear more IT will improve information quality.

...AN ELABORATION-5

- However, there is also quite a lot of concern about “computer crime” and the auditability of computerized information systems as computer use becomes more and more common.
- As a result, that is there clearly is a genuine uneasiness in evidence, caused by the increased dependence on computer-based information systems.

...AN ELABORATION-6

- Increased leverage, such as increased information technology leverage because of increased technological effectiveness, means increased risk, in this case information technology risk.
- But there are other factors at work.
- As indicated through earlier lectures and this course will further argue, information should be seen as a composite good; a bundle of interrelated attributes. Given that information is for use, one attribute is relevance, i.e., usefulness, second is usability, and third is integrity, i.e., freedom from distortion and noise.

...AN ELABORATION-7

- Before the advent of computers there was one equilibrium between the costs and benefits associated with different attributes.
- This resulted in a certain levels of production and consumption of them (costs and benefits), and, thus, in certain kinds of information and information systems.

...AN ELABORATION-8

- Computerization has changed the parameters, and so the theoretical equilibrium (between costs and benefits associated with attributes) has moved.
 - Where as information content (exact information), before computerization, was relatively costly to obtain, it is now comparatively cheap (e.g.; phenomena such as “information overload”).

...AN ELABORATION-8

- Other considerations, or constraints, now dominate, as the law of diminishing marginal returns begins to operate with respect to information content or quantity – considerations associated with I^*I and with the costs of evaluating and applying increasing amounts of information.

...AN ELABORATION-9

- With respect to I*I the problem is, in general terms, that the technology to provide it has not quite kept up in terms of cost-effectiveness with the technological advances that enable us to provide increased quantities of information, i.e., information, which is to be originated.

...AN ELABORATION-10

- If, say, in some cases it now costs as much to provide 100 units of information as it did to provide 1 unit a couple of decades ago, it is by no means likely that the integrity of these 100 units of information can be protected and ascertained at a cost corresponding to the one required for the single unit of pre-computer day information.

...AN ELABORATION-11

- Certainly, we are anticipating here the thesis that what we will develop as the course progresses.
- What is indicated is that a simple economic argument can be developed to show that, in violation of common practice, I*I has indeed become more important as information technology has advanced.

EXERCISES - 1

- (E7.1) Why does an identified business information specialization* increase in importance as the business (organization) becomes more responsive to the environment, which is increasingly developing in complexity?
 - * For example in respect of economic statement, such information is accounting information by way of market price mechanism in combination with “money”; in respect of recruitment market, it can be the candidates’ educational performance evaluation mechanism along with “cumulative grade point average” (CGPA) or total percentage (%) marks).

EXERCISES - 2

- (E7.2) Illustrate the proposition in Exercise (E7.1) with help of a field example drawn from area other than business economics, e.g., from education, healthcare, software product development, manufacturing, or facility planning, etc.
- (E7.3) Given that the accounting information is **useful/usable** part of the market mechanism for resource allocation and that efficient resource allocations requires competition, further reinforce the argument that as the economy increases in complexity, the accounting information increases in importance.

EXERCISES - 3

- (E7.4) “The efficiency, degree of specialization and sustainable complexity of environment based (responsive) systems, their sub-systems and their components are on rise – these things go hand in hand”. Explain.
- (E7.5) Consider an environment responsive system. The system processes information “ I_1 ” and is characterized by system information $[(I) = \{I_1, I_2, I_3\}]$, where:
 - Information “ I_1 ” is a measure or an aggregate, which is used for comparing and selecting (system purpose is decision making) and which minimizes transaction and contracting costs,
 - Information “ I_2 ”, on environment (market) imbalances indicating opportunities (i.e., system performance improvement opportunities or business opportunities), and
 - Information “ I_3 ”, constituting knowledge of working mechanism for resource allocation.

EXERCISES - 4

Explain why, in such a system, information $[(I) = \{I_1, I_2, I_3\}]$, and particularly information $\{I_1\}$, becomes of increased importance as environmental (read informational) complexity increases.

- (E7.6) Show that for (system/business) competitive advantage, information $[\{I\} = \{I_1, I_2, I_3\}]$, and particularly information (I_1) , must be *correct*, i.e., with integrity.
- (E7.7) Within the framework of Exercise (E7.6) explain that it is by controlling integrity of information (I) , and particularly that (integrity) of information (I_1) , that the competitive advantage is achieved.

EXERCISES - 5

- (E7.8) “Integrity of a set of information is defined as the inverse amount of distortion and noise present”.

What do you understand by terms “*correctness*” aspect of information and “*exactness*” aspect of information? What is the difference?

- (E7.9) “In computer science, Information Integrity is seen as the problem of Data Integrity and dealt with, on a technological level, mainly as a sub-field of computer security. Other sub-fields are confidentiality and privacy.

EXERCISES - 6

In discipline of accounting issues of I*I are seen from the angle of auditing and internal control. Thus once again I*I is seen as sub-field of security, other sub-fields, however, being confidentiality and availability.

Assumption is more efficient information technology should result in, among other things, a greater concern (benefit) with I*I, not least accounting information integrity (it is common to hear more IT will improve information quality)”.’

How valid is this assumption? Briefly comment.

EXERCISES - 7

- (E7.10) “Information should be seen as a composite good; a bundle of interrelated attributes. Given that information is for *use*, one attribute is relevance, i.e., usefulness, second is usability, and third is integrity, i.e., freedom from distortion and noise”.

What do you understand by this? Explain briefly.

- (E7.11) Discuss how increased IT usage has led to shift in theoretical equilibrium between costs and benefits associated with information attributes. Discuss how and why this has brought in the issue of cost of analyzing and evaluating information, which traditionally has not been the information system concern.

EXERCISES - 8

- (E7.12) Develop a simple, heuristic economic argument to show that, in violation of common assumption in Exercise (E7.9), Information Integrity has indeed become more important as information technology has advanced.

THANK YOU