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M12.2 - Value of Information and of Information Systems: basic approaches

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1. Value of Information: a qualitative approach from Moody

Information as an asset and an economic good

- Is information an asset?
- (from Wikipedia) In financial accounting, **assets** are economic resources.
- Anything tangible or intangible that is capable of being owned or controlled to produce value and that is held to have positive economic value is considered an asset

Valuation of information

While hardware and (rarely) software assets in Information Systems are capitalised, the valuation of information has been largely ignored, even though this is a much more valuable asset from a business viewpoint.

Information as a key economic resource

 Indeed, information is increasingly being recognized as a key economic resource and the basis for achieving competitive advantage (Moody & Walsh, 1999).

Information vs other assets

- Like other organisational assets, information has
 - a cost (how much it costs to acquire, store and maintain it) and
 - a value (how much it is worth to the organisation).
- However this is where the similarity ends.
- Information does not obey the same laws of economics that other assets do— it has some unique properties or laws which must be understood in order to be able to measure its value. Let's see some of them.

Economic characteristics of products (in general)

The typical economic product displays such properties as

- Appropriability, (i.e., either I have it a kilo of oranges or you have it);
- Decreasing returns to use (e.g. a vehicle depreciates based on kilometers travelled), and
- Scarcity (e.g. sooner or later, the availability of oranges at the market ends)



Law 1: Contrary to goods, information is infinitely shearable

Information can be shared between any number of people, business areas and organisations without consequent loss of value to each party (e.g. the World Wide Web)



Law 2: The value of information increases with use

Most resources exhibit decreasing returns to use that is, they decrease in value the more they are used (e.g. vehicles, aircrafts) information increases in value the more it is used



Law 3: Information is perishable – Ex. Online tickets

Like most other assets, the value of information tends to depreciate over time. The speed at which it loses value depends on the type of information and the type of usage



Law 4: The value of information increases with accuracy

The more accurate information is, the more useful and therefore valuable it is. Inaccurate information can be very costly to an organisation in terms of both operational errors and incorrect decision making.

VALUE (\$)



Law 5: The value of information increases when combined with other information

Information generally becomes more valuable when it can be combined with other information. For example, customer info. and sales info. are each valuable info. sources in their own right, but being able to relate the two sets of info. Together is infinitely more valuable from a business viewpoint.



Law 6: More is not necessarily better



- Moody ha ben rappresentato questo fenomeno.
- La figura mostra in forma qualitativa come evolve il valore conoscitivo all'aumentare dei dati disponibili (qui chiamati informazione).
- All'inizio più dati corrispondono a piu' valore.





Moody - 2

Ma da un certo punto in poi i nuovi dati a noi disponibili sono talmente tanti che non riusciamo cognitivamente a considerarli insieme agli altri per produrre nuova conoscenza (questo e' il punto di massimo valore).



Da questo momento in poi, nuovi dati non solo non riescono a produrre nuova conoscenza, ma provocano un fenomeno di "blocco" per cui provocano spesso una sorta di regressione e di cancellazione della conoscenza accumulate, ovvero una situazione di tale confusione che precedenti certezze o conclusioni tornano in discussione.

Moody - 3



1999 Moody Law 7 Information is not depletable

- Most resources are depletable the more you use, the less you have.
- However information is self generating the more you use it, the more you have.
- This is beacuse new or derived information is often created as a result of summarizing, analysing or combining different infrmation sources together
- The original information remains, and the derived is added to the exixting asset base.

Furthermore Moody & Walsh, 1999 Law 7 Information is not depletable......

 Unlike other commodities, which are nonrenewable and with few exceptions depletable (the more you use it, the less you have) information is self regenerative

Unused information

In many organisations, there is a large amount of information that is collected and stored but never used: this represents waste.

Unused information is really a liability (negative value), because

- no value is extracted from it, and
- the organisation incurs future costs of storage and maintenance.

Esercizio facoltativo con premio (un punto)

• Fornisci uno scenario (da 10 righe a mezza pagina al massimo) per ciascuna delle leggi di Moore 1-7, tratto dal web o dalla vita quotidiana o dal lavoro.

Determinants in Moody's Laws

Information Value Laws (L)	Characteristics	Determinants
L1. Information is (infinitely) sharable	Format	Information diffusion
L2. The value of information increases with use	Contents	Information quality
L3. Information is perishable	Timeliness	Information quality
L4. The value of information increases with accuracy	Contents	Information quality
L5. The value of information increases when	Format	Information structure
combined with other information		(integration)
L6. More is not necessarily better	Cost	Information utility
L7. Information is not depletable	Timeliness	Information quality

Value of Information Systems: classifications from Marthandan

Information System evaluation definition

A process, or a group of parallel processes, which take place

- at different points in time or
- continuously

for searching and for making explicit,

- quantitatively or
- qualitatively,

all

- the impacts of an Information Technology Information System (IS) /Project (as evaluated or perceived by users ansd stakeholders) and
- the programme and strategy of which it is a part.

To measure IS success is a difficult task as user and stakeholder perspectives can be so different.

Reasons not to do IS evaluation

Inhibitors to an effective evaluation:

- Inability of quantifying relevant benefits,
- inability to identify intangible benefits,
- inappropriate measures,
- no satisfactory metrics available,
- poorly defined IT deliverables
- lack of time,
- identification of relevant costs.

Classifications of IS evaluation methods

Classifications of IS evaluation methods - 1

- First order methods, that examine cost and return figures, e.g., payback period, etc., and
- Second order methods that examine intangible benefits and risks, e.g., value analysis and information economies.
- To evaluate project feasibility, first order methods are used initially. If a conclusion can be derived, the evaluation stops here.
- If the evaluation is inconclusive, then second order methods will be applied.

Classifications of IS evaluation methods - 2

- Ex-ante vs
- Ex-post

Points in time of the evaluation 1. ex-ante or predictive

An ex-ante evaluation is needed for several reasons:

- to justify investments,
- to enable organisations to decide between alternative projects,
- to control IT expenditures,
- to improve the investment selection process, and
- to facilitate project management

Points in time of the evaluation 2. ex-post or for performance assessment

An ex-post evaluation assesses if

- expected benefits have been achieved
- as well as the reasons why the expected benefits have not been achieved
- It help organisations assess if intended objectives have been met.
- Evaluation can be for both control and learning purposes, e.g.,
 - sharing lessons learned which contribute to better planning in future,
 - improve project management, and
 - improve staff and management competence.
- A post-implementation evaluation is critical to learn how IT is used and adopted by users.

Classifications of IC evaluation methods – 3

- Financial, IS investment is evaluated the same way as other capital investment, e.g. through capital budgeting → see later
- Strategic, when the new Information System is coherent with the strategic objectives of the organization.

Capital budgeting, and investment appraisal

Is the planning process used to determine whether an organization's long term investments such as

- new machinery,
- replacement of machinery,
- new plants,
- new products, and
- research development projects

are worth the funding of cash through the firm's capitalization structure (debt, equity or retained earnings). It is the process of allocating resources for major capital, or investment, expenditures.

Methods for capital budgeting

Many formal methods are used in capital budgeting, including the techniques such as

- Accounting rate of return, calculates the return, generated from net income of the proposed capital investment, and does not take into account the concept of time value of money
- Payback period, the period of time required to recoup the funds expended in an investment, or to reach the break-even point
- Net present value, calculated by subtracting the present values (PV) of cash outflows (including initial cost) from the present values of cash inflows over a period of time

Cristicisms to capital budgeting - 1

- Although we hope to see positive financial returns from IT investments, but to make investment decision based on financial figures alone could be misleading.
- Justifying IT investment based on cost savings can lead business managers to make an investment decision immaturely.
- An IT investment might bring short-term cost savings while the other, although not seeing immediate savings, could bring long-term strategic benefits. Often, these strategic benefits are intangible and non-financial.
- Intangible dimension of IS business value has made the traditional economic analysis insufficient and call for a better approach to measuring IS business value.

Cristicisms to capital budgeting - 2

- Traditional financial techniques are inadequate in evaluating IT investments that are of high uncertainty.
- Three characteristics, i.e.,
 - cumulation, i.e. products/services of one organization can be further processed or added to products of another organization. In this way, production may be aggregated with other partners inputs, thus, offering additional opportunities to create value.
 - Dynamism boosted by networked economies

- Complexity,

 make IT investments highly uncertain and volatile. The need for an agile and integrated IT in today's dynamic business environment has added a challenging dimension to IS evaluation.

Strategic

- Often, strategic benefits are intangible and non-financial.
- Long term strategic objectives can be expressed in terms of
 - competitive advantages, or
 - critical success factors.

Classifications of IC evaluation methods – 4

- Summative, an ongoing evaluation during the development process which influences the attributes and features of the final IS.
 - \rightarrow Assess the process
- Formative, normally performed at postimplementation stage to summarise lessons learnt and assess the impacts the system has brought
 - \rightarrow Assess the outcomes

Putting together strategic, summative, formative IS evaluation can be performed as...

- strategic evaluation or pre-implementation evaluation during feasibility study stage,
- formative evaluation during development stage,
- summative evaluation or post-implementation evaluation after implementation stage,
- and post mortem analysis for lessons learned from the development project

Classifications of IC evaluation methods – 5

- Quantitative or financial
- Qualitative or non-financial

especially in the evaluation of benefits of the new IS ightarrow

Quantitative vs qualitative result into four types of **benefits**:

Observable, measurable, quantifiable and financial.

- Based largely on opinion or judgement, **observable** benefits are subjective, intangible or qualitative.
- Although having a measure identified, measurable benefits are difficult to prove especially on the extent of improvement after the investment.
- **Quantifiable** benefits can be measured rather easily before and after the investment.
- Financial benefits are described in financial figures.

Qualitative approaches result also in **perception-based evaluations**

- Considers opinions of different stakeholders.
- As perceived value of IS is derived from the use of IS, users are the right evaluators.
- Moreover, different people interpret value differently.

Classifications of IC evaluation methods – 6

In **goal-free evaluation**, no organisational goals have been specified. Instead this inductive approach examines actual systems effects and then evaluates how important these effects are to the organisation and its stakeholders.

In **goal-based evaluation**, organisational goals are first defined and then used to assess to what extent IT has helped in meeting the specific goals.

In **criteria-based evaluation**, criteria have been defined for the evaluation purposes.

The major difference between the criteria-based evaluation and goal-based evaluation is that unlike in goal-based evaluation where goals are organisational context specific, the criteria used in criteria-based evaluation are general and not organisation-specific.

Left overs

From Moody

- The growing relevance and adoption of enterprise systems and the consequent role of the IT in business shifted the attention towards the value of information associated with companies' value chains.
- In the information systems area, in particular, Glazer (1993b) considers the information value associated to a given transaction as the sum of

(1) *profits* that result from *increased revenues* and *reduced costs* from *future transactions*; and

(2) *profits* from the *sale of the information* itself.

Accounting Valuation Models

There are three major asset valuation paradigms used in accounting theory (Godfrey et al, 1997):

- Cost based (or Historical Cost)
- Market (or Current Cash Equivalent)
- Utility (or Present Value)

Cost based (Historical Cost)

- Using this method, the asset is valued based on how much was originally paid to acquire the asset (purchase price or development cost).
- The rationale behind this is that cost approximates the value of the asset at the time of acquisition.
- The assumption is that a firm, behaving rationally, will only spend money to acquire an asset if it believes it will receive at least an equivalent amount in the future in service potential or economic benefits.

Cost based (Historical Cost)

- This is the traditional cost accounting approach to valuing assets, and is still the most widely used method in practice. It has been the subject of much criticism (Ijiri, 1971), but no alternative model has gained sufficient support to replace it (Henderson and Peirson, 1998).
- The major advantage of the historical cost method is that it is the easiest to collect, and (arguably) the most reliable and objective.
- Its major weakness is that it may not reflect the current value of an asset.
- For example, a property may have been purchased at a given price, but its value may have increased or decreased dramatically since that time.

Market (Current Cash Equivalent)

- Using this method, an asset is valued based on how much other people or organisations are prepared to pay for it. This equates to value in exchange.
- For example, property can be valued based on its estimated selling price. The major strength of this method is that it gives a good indication of the current value of the asset.
- A growing number of accountants believe that market prices should be used instead of historical costs for all valuations; this is called current cost accounting (Chambers, 1966).

Market (Current Cash Equivalent)

- Empirical evidence suggests that current cash equivalents are available for most assets, and that they can be determined with a reliability comparable to historical cost (McKeown, 1971; McDonald, 1968; Sterling and Radosevic, 1969).
- The weakness of this method is that it is more timeconsuming and expensive than measuring historical cost (Henderson and Peirson, 1998).
- Related concepts to market price are replacement cost (the cost of replacing the asset by a new one), current cost (the cost of replacing the asset by a similarly used one) or net realisable value or NRV (which is the amount the asset could be sold for, less any costs of selling it).

Utility (Present Value)

- Using this method, the asset is valued based on the present value of expected future economic benefits; this equates to value in use. For example, property may be valued based on the discounted value of expected future rents.
- There is wide agreement that, conceptually, this is the best approximation to the true economic value of an asset (Godfrey et al, 1997).
- The major weakness of this method is the difficulty of determining the specific future cash flows related to the asset, which is often quite subjective and therefore of doubtful value to statement users.

Utility (Present Value)

- For most assets, there is great difficulty estimating future economic benefits; difficulties in converting these economic benefits to monetary equivalents which can be discounted; and there is the technical problem of choosing a discount rate (Henderson and Peirson, 1998).
- In practice, this method is primarily used for long term monetary assets (e.g. bonds, leases), where the future cash flows are specified by contract and can therefore be determined objectively.
- For non-monetary assets, it is virtually impossible to determine their future cash flows (Godfrey et al, 1997).

Methods for capital budgeting

Other methods

- Average accounting return
- Profitability index
- Internal rate of return
- Modified internal rate of return
- Equivalent annual cost
- Real options valuation