Disclaimer:
This note is NOT intended to cover all the material. Neither will this note provides all the related details. It only aims to help provide a general guidance for the review. The author has NO responsibility of any kinds by providing this note out of courtesy.

IT History [Lecture 2, Reader pp 1~25]

What distinguished the Data Processing Era from the Micro-Era?
- Data Processing Era (1960~1980)
  Mainframe, centralized data, hierarchical functional department structure
  PC on every desk, decentralized data, prevalence of PC

What distinguished the Micro-Era from the Networking Era?
  Decentralized data, fragmented information systems, uncoordinated management of PCs
- Network Era (1995~)
  Client/Server concept, Server hosted organizational data, no more fragmented

Why did Data Processing Managers feel threatened in the Micro-Era?
- Easier to manage one central mainframe than a huge amount of PCs
- Data not centralized
  - Replication of accounting/reporting functions
  - Data inconsistency between different PCs
- Security risks
Related stuff:
• Data Processing Era (1960~1980)
  – DP manager, annual/capital budgeting, benefits of DP Era for business
• Micro Era (1980~1995)
  – Starting from 1981, IBM introduced PC
• Network Era (1995~)
  – Fragmented IT organization, CIO
  – Internet Phenomenon, new ways of doing business
  – Information Resource Management
• [Messerschmitt]
  – Centralized: a few big mainframes to automate business functions (eg. payroll, accounting)
  – Time-shared: terminals added for accessing mainframe
  – Decentralized: PCs on every desk
  – Networked: applications could be geographically distributed

RoR Analysis [Lecture 3, Cash Flow handout]

Net Present Value (NPV)

Definition?
• The Net Present Value of a cash flow is a quantity of money, which if received today, would be equally desirable as the cash flow.
• “How much does a dollar in tomorrow worth today?”

Formula?
• in terms of interest rate $i$

\[
NPV := x_0 + \frac{1}{1+i} x_1 + \left(\frac{1}{1+i}\right)^2 x_2 + \ldots = \sum_{j=0}^{\infty} (1 + i)^{-j} x_j
\]

• in terms of discount factor $\delta$

\[
NPV := x_0 + \delta x_1 + \delta^2 x_2 + \ldots = \sum_{j=0}^{\infty} \delta^j x_j
\]
[NOTE]
(1) actually, \( \delta := \frac{1}{1+i} \) in our case
(2) “present” is at time slot 0; \( x_0 \) is the amount of money (either negative (investment) or positive (revenue) happened now)
(3) The formula is discounting \( x_1, x_2, \ldots \), i.e. all the future cash flow, into today.
(4) The summation is summing over all the future cash flow. In the above 2 formulas, it supposes that the cash flow happens forever. If a project only generate revenue for \( n \) years, then the formulas will become
\[
NPV := \sum_{j=0}^{n} (1 + i)^{-j} x_j \quad \text{or} \quad NPV := \sum_{j=0}^{n} \delta^j x_j
\]
(5) Discount rate is an equivalent term of interest rate in some problems

Rate of Return (RoR)
Definition?
• The return on investment, or more commonly called the rate of return (RoR), is an inverse problem to computing the NPV.
• “What would the interest rate at the bank have to be in order for me to be neutral about investing in my project?”

How to compute?
• Formula
\[
x_0 + \frac{1}{1+i}x_1 + \left(\frac{1}{1+i}\right)^2 x_2 + \ldots = 0
\]
• Meaning
  – \( x_0 \) is the amount money of your investment of the project, usually negative
  – \( x_1, x_2, \ldots \) are the future revenues you’ll get from this project. \( x_1 \) is the revenue of 1st year from now, etc.
  – By setting the \( NPV \) of this kind of cash flow to 0, we will be neutral about investing since the \( NPV \) of the cash flow incurred by this project is 0.
  – Suppose the solution of RoR we computed is \( i^* \).
    1. If the interest in the bank, \( i \), is great than the RoR, \( i > i^* \), investing is not profitable since we could make more money by putting the money in bank;
    2. If \( i < i^* \), investing in the project is preferable since the revenue generated by this project in the future is larger than the interest profit we might have by saving money in bank.

Quadratic formula

Usually, you will face a equation in the following form
\[
x_0 + (1 + i)^{-1} x_1 + (1 + i)^{-2} x_2 = 0
\]
To solve it, following steps below:
1. Let \( \delta = (1 + i)^{-1} \), then the equation becomes
\[
x_0 + \delta x_1 + \delta^2 x_2 = 0
\]
2. Using the quadratic formula

\[ \delta^* = \frac{-x_1 \pm \sqrt{x_1^2 - 4x_0x_2}}{2x_2} \]  

(General form of quadratic equation/formula,

\[ ax^2 + bx + c = 0 \]

\[ x^* = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]  

)  

3. Formula (⋆) will give you 2 roots of the quadratic equation. Drop the negative root (if any) since the discount factor we are computing here won’t be negative.  

4. Remember back-substituting \( \delta^* \) into \( \delta = (1 + i)^{-1} \) and get the RoR as the \textit{REAL} solution

\[ i^* = \frac{1}{\delta^*} - 1 \]

[Remark]

The goal of the RoR problem is to compute a \( i^* \) based the cash flow of a project given by the problem. All you need to do is to understand and follow the steps above to get the \( i^* \). Yet, the problem may also give you an interest rate offered by the bank, say \( i \). Then you could compare this \( i^* \), i.e. your RoR, to the interest rate offered at the bank and see whether the project is lucrative.  

If \( i^* = i \), then either saving the money in bank or invest it into the project will give you the same result (that’s exactly the meaning of “being neutral of investing or not”);  

If \( i^* < i \), then by saving money in the bank you could end up w/ more; otherwise (\( i^* > i \)), the project could give you more profit than saving your money in the bank.

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O’Brien Chapter 2

- Porter’s Competitive Forces [Reader pp42, Lecture 4]
  - Bargaining power of customers  
  - Bargaining power of suppliers  
  - Rivalry of competitors (intra-industrial competition)  
  - Threat of new entrants  
  - Threat of substitutes

- Why is Porter’s Competitive model useful?  
  - a way to evaluate competitive environment, internal processes

- Porter’s Competitive Strategies [Reader pp43]
  - Cost Leadership Strategy  
  - Differentiation Strategy
– Innovation Strategy
– Growth Strategy
– Alliance Strategy

• Other Competitive Strategies

– Lock in customers and suppliers [Reader pp44]
  building valuable new relationships with customers and suppliers
– Switching Costs [Reader pp45]
  investment in information system technology can make customers/suppliers dependent on
  those convenient/efficient systems
  thus switching to others may cost
– Barriers to Entry [Reader pp45]
  increasing the investment/complexity of the technology required to compete in certain
  industry or market

• Porter’s Value Chain [Reader pp46, Lecture 4 slides 32~37]

  – views a firm as a series, chain, or network of basic activities that add value to its products
    and services, therefore adding marginal value to the firm
  – highlight where competitive strategies can be applied
  – developing strategic use of IS for basic process that add the most value to products/services
  – ultimate objective is value to customer

• Business Functions [Lecture 4, slides 22~23]

  – A group of people w/ related specialized skills
  – eg. design, sales, etc

• Business Process (also in Messerschmitt 3.3.1) [Lecture 3, slides 24~27]

  – A designed succession of actions to the accomplish of some result in a business
  – eg. Order fulfillment

• Business Process Re-engineering (also called Business Transformation in Messerschmitt 3.3.1)
  [Reader pp52]

  – A fundamental rethinking and redesign of business processes
  – Compared w/ streamlining the business process which means minor improvements to busi-
    ness processes

• Agile company [Reader pp55]

  – can make a profit in markets w/ broad product ranges, short model lifetimes
  – can produce orders in arbitrary lot size, support mass customization

• Virtual company [Reader pp57, Lecture 4 slides 45~48]

  – an organization that uses IT to link people, assets and ideas

• Intranets, Extranets [Reader pp57, Messerschmitt 4.5]

• Knowledge vs. Information (refer to [Messerschmitt 2.3, pp 39~41]

• Knowledge Management [Reader pp58~59]
Messerschmitt 2.3

  - Data
    - the numbers, character strings, etc. the represent information
  - Information
    - Recognizable patterns of data organized so as to inform or influence the user in some way
  - Knowledge
    - Concepts, relationships, truths, principles derived from information

- Authors, Publishers, Indexers, Recommenders [Messerschmitt pp41-47, Table 2.9]

- Information Push [Messerschmitt pp46-50, Table 2.10; Lecture 6, slides 25-27]

- Information Pull

Messerschmitt 3.1

Organizational Applications [Messerschmitt pp60-72]

- Departmental Applications
  - supports a single functional dept.

- Enterprise Applications
  - supports enterprise-wide processes and goals

- Commerce Applications
  - supports organizations engaging in commercial relationships w/ one another

- Customer Care or Customer Relationship Management (CRM)

Messerschmitt 3.2

Departmental Applications [Lecture 6]

- Transaction Processing Systems [Lecture 6, slides 36]
  - Record and process data from business transactions

- Batch transaction processing [Lecture 6, slides 36]
Transactions are accumulated over a period of time and processed periodically

- On-line Transaction Processing [Messerschmitt 72~73, Lecture 6, slides 36]
  - Transactions are processed immediately

- Workflow [Messerschmitt 73~75, Lecture 6, slides 37~38]

**Messerschmitt 3.3**

**Enterprise Applications [Lecture 7]**
- Business Processes [Messerschmitt pp76]
  - A designed stream of activities to accomplish some results in a business
- Business Transformation (Business Process Re-engineering, [O’Brien Ch2]) [Messerschmitt pp77~78]
- ERP (Enterprise Resource Planning) [Messerschmitt pp79~81]
- Legacy Applications [Messerschmitt pp81, sidebar]
  - applications deployed years ago using now-obsolete technology, an obstacle to enterprise app
- Decision Support [Messerschmitt pp81]
- Knowledge Management (also in [O’Brien Ch2])
- Data Warehouse [Messerschmitt pp83, sidebar]
  - a very large nonoperational database that systematically captures information from a number of operational OLTP databases.
  - benefits: history stored, consolidation of data from spread databases

**Messerschmitt 3.4 [Lecture 8]**
- Electronic Commerce [Messerschmitt pp83~89]
  - 3 types of e-commerce [Messerschmitt, Table 3.4, pp84]
  - 4 steps in a typical e-commerce transaction [Messerschmitt, Table 3.5, pp85]
  * Matching Buyers and Sellers
    - Catalog, Advertising, Intermediary Recommendation
  * Negotiating Terms and Conditions
    - Auction, Fixed Price, Price Discrimination
  * Consummation
    - Order, Fulfillment, Payment
  * Customer Service
- Consumer Commerce (B2C)
- eg. Amazon

- Inter-consumer Commerce (C2C)
  - eg. eBay

- Inter-enterprise Commerce (B2B) [Messerschmitt, pp92~95]
  - Procurement
    - one enterprise purchases goods/services from another
  - Direct Procurement [Messerschmitt, Table 3.7, pp92]
    - obtain raw materials/parts that are directly incorporated into products and service
    - ongoing, consistent and scheduled procurement
    - focusing on long-term supply relationship
  - Indirect Procurement [Messerschmitt, pp 95]
    - sporadic purchase of goods and services to support organizational objectives
  - Supply chain Management (SCM) [Lecture8 slides 34~36]
    - Supply Chain: relationship between firms involved in direct procurement
  - Mass Customization (eg. Dell)
  - Electronic Data Interchange (EDI) [Messerschmitt pp94, Lecture8 slides 37]
    - Exchange order information between firms involved in direct procurement
    - initially only order and invoice, later added electronic payment, Financial EDI (FEDI)

- Customer Relationship Management (CRM) [Lecture8, slide 23]

- Recommender Systems [Lecture8, slide 29]
  - find users w/ similar interests/purchases/visits
  - recommend products based on similarities between customers

- Intermediaries
  - the role of intermediaries in e-commerce, B2C/C2C/B2B

Messerschmitt 4.1 [Lecture 9]

- Data vs. Information [Messerschmitt pp108~112] (also refer to Messerschmitt 2.3 above)

- Data
  - BIT (BInary digiT): 0/1
  - Data: collection of bits

- Information
  - Compared w/ definition on [Messerschmitt pp39]
from application perspective, Information is defined from user’s perspective as patterns or meaning that influence the user in some recognizable way

within the context of Information Technology, Information is defined more narrowly, as “structure and interpretation added to data”

- Information represented as data [Lecture 9, slides 25~36]
- Is it always possible to recover information from data?
  - Information→Data : Representation
  - Data→Information : Data Processing
  - note that data processing is based on presumed structure and interpretation imposed on data, otherwise the information could not be recover (at least correctly) from the data

- Regeneration [Lecture 9, slides 37~43]
  - make a precise copy of the data (copy bit by bit)
  - if the structure and interpretation (so-called “Representation”) is known, then the information is actually replicated as well along w/ the data
  - several implications (see slides)

**Messerschmitt 4.3**

- **System/Subsystem**
  - System: a composition of subsystems that cooperate to accomplish some purpose
  - Subsystem: an element within the system that performs some well-defined action on behalf of that system

- **System Architecture Elements** [Messerschmitt pp115, Table 4.2]
  - Decomposition: partitioning the whole system
  - Functionality: specialized capabilities assigned to each subsystem
  - Interaction: subsystems cooperate together to support the system’s goal

- **Why architect systems in this way?** [Lecture 9, slides 55]
  - divide & conquer reduce complexity
  - reuse components
  - in accordance w/ industry structure, etc.

- **Emergence** [Messerschmitt pp116]
  - higher-order behavior emerges because the subsystems are composed
Messerschmitt 4.4

- Infrastructure Software Layering [Messerschmitt pp120~121, Figure 4.7]

- What is the benefit of architecting software with layers?
  - achieves additional capacity by adding to the infrastructure rather than building from scratch

- Operating System [Lecture 9, slides 60]
  - hide equipment details from layers above

- Middleware
  - sits between Application/Operating System
  - isolating an application partitioned across hosts from differences among various operating systems of their host
  - hide OS details from applications

- File System [Lecture 9, slides 61]
  - File
    * collection of data managed for the benefit of the application
    * size known, structure & interpretation is unspecified (which depends on the corresponding application)

- Database Management System [Lecture 9, slides 68~70]
  - Database: a file containing interrelated data w/ specific predefined structure
  - DBMS: manage multiple databases, basis of OLTP

- Network Functions [Messerschmitt pp122]
  - allows hosts (computers connect to network) to communicate
  - authorization/authentication

- Message
  - the smallest unit of data that makes sense to the applications
  - size known, again, structure & interpretation relies on the corresponding application
  - analogous to “File”

- Packet [Messerschmitt pp123, sidebar]
  - fragments of message which could be later reassembled into the message after reaching the destination
Messerschmitt 4.5

- internet
  - a network of networks
  - standard ways to interconnect networks
- Internet
  - a specific internet
  - the major global internet
- intranet
  - private internet, for exclusive use within an enterprise
- extranet [Lecture 9, slides 73]
  - is composed of intranets connected through an unprotected domain (typically the Internet)
  - using encryption and other security technologies to protect confidentiality

Case Studies

Please read the case studies in the Reader and summarize answers for those question by yourself.

Frito-Lay Case

- What was the HHC?
  - Hand Held Computer, for each salesperson to carry around, log sale transaction data
- What were the main reasons why Frito Lay deployed the HHC?
- What changes in marketing strategy did Frito-Lay believe the HHC data would help enable?
- How might the HHC project change Frito-Lay’s competitive position with its direct competitors, new entrants, and its customers?

Cisco ERP

- What are some of the actions that Cisco took that contributed to the successful deployment of their ERP?
- What mistakes did Cisco make?
- What are the most important lessons that another company that wants to deploy ERP could learn from Cisco's experience?
Alibris Case

- How did Alibris plan to change Interloc’s revenue model?
- What were the potential benefits and risks of this change?
- Why did Alibris abandon Thunderstone software, and why did it choose to switch Oracle?
- What made Alibris’ IT challenge particularly difficult compared to what other E-commerce companies faced?