The Importance of Basic Printing Education

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The Importance of Basic Printing Education for Human Resource Development in Printing Industry

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Abstract

   Education is the way to develop the skill of ability of human resources. Today, technology develop very fast, all information network channel also develop too. Technology could not be caught but possible to learn. Education must be develop in the same way of technology, upgrade curriculum, upgrade the lecture and upgrade the knowledge related with this field. In this research, we will figure out how importance the education and science knowledge is in this Industry related the development of information technology. In the past, worked based on experience and learned by doing still possible, because technology still conventional. Today, technology making revolutionary, all changed. It driven the industry and push the development on the industry. Today, Indonesian printing industry standardization compare with other country in South East Asia, it still under minimum standard of them. Other country in south East Asia like Thailand, they make revolutionary change since 12 years ago. Their government sent all education staff and member study abroad until graduated, and then contract them to develop it in Thailand. Singapore, Malaysia, Vietnam then Philippines also do the same thing. Based on that view, it gives as a picture if education is important in any sectors. In this discussion we focused on Printing Industry. What is printing? Printing is kind of technique to send any message, idea, information, through hardcopy which made by print process. How to make the printing result for end user in best quality, we will discuss how important on it. All human being in the world use all printing product from invitation, book, newspaper, magazine, packaging, media promotion, etc. People from this industry lead the process in order the printing product satisfied and high quality. In the printing house side, expert people in this area will have them to make all the process efficient and effective.

Keywords: Printing, Science Knowledge, Information Technology

A. Background

   Printing Industry is an industry that design, develop, create and introduce products containing or relating to the sentence and or images to realize the information, ideas and feelings. The product is use for the sake of learning, entertainment, motivate, commercial, etc. This industry is specific and complicated. This industry cannot develop only based on experiences, they must consider with basic education that has contribution significantly. Today printing industry was innovated together with technology. High quality printing was

needed. Producing high quality product in printing industry especially packaging or others, basic printing education is not enough. That's why we called it specific and complicated. Education about material science also has contribution too. Before printing processing begun, the operator must recognize the characteristic of supported and core material very well. Machine is second aspect, human resources with adequate knowledge is first and core aspect. Although the company have high tech printing machine but the human resources didn't support it, it will disaster for the company itself. Since technology mix with this industry many company looking for expert in this industry who has knowledge from the beginning until the end of production processing.

Printing industry now one of basic industry that gives contribution of GDP in Indonesia. Indonesian government launched and concern creative industry development. Printing Industry also ten biggest industries in the world.

10 Large Manufacturers in the World 2014.
- Production & Oil / Coal
- Automotive Industry and parts
- Industrial Electronics and Electrical Equipment
- Food industry
- Chemical industry
- Industry Computer / Office Equipment
- Industry Iron / Steel
- Industrial Medicine
- Industrial Equipment Industry
- Publishing and Printing Industry

B. Printing Industry Growth in Indonesia

It is estimated that world growth in the graphics industry around 2-5% per year in the period 2010-2016. This industry has growth year by year. In Indonesia there are no exact figures, but estimated about the same as Indonesia's economic growth. In the global level the growth of Large Format Printer (LFP) most rapidly at around 6-9% per year (SOHO printer growth of 20-40%, the growth of digital cameras 20% per year). Indonesia growth in Large Format Printer predicted 8-13% in 2016.

Table 1　Economic growth in Indonesia (source: Indonesian Statistic Agency)

GDP	2013	2014	2015	2016 *	2017 *
Growth	5.58%	5.02%	4.8%	5.18%	5.7%

Note: * forecast (year on year rate in percent at constant market price)

C. The Total Number of Graphics and Media Industry in Indonesia

Based on latest data from Indonesian Printing Industry Association (PPGI) on 2016 survey, the lists of member printing industry at Indonesia that have specification and product diversification are below:

That listed exclude not member industry. If total populations of Printing Industry at Indonesia mix member of association and non-member association 10,000 industries in all sectors, mostly middle down size. Usually the company owner is same person, they build sister company or their old company bankrupt then build new one but today since 2014, the industry growth with many new comers.

Table 2　Indonesian printing industry mapping (Source: PPGI Data 2016)

No	Industry Type	Number (company)
1	Printing House	2,655
2	Book Publisher	1,017
3	Media Publisher	802
4	Research Journal Publisher	162
5	Design Service	103
6	Reproduction Service	52
7	Packaging	65
8	Paper and Pulp	128
9	Printing Ink Company	37
10	Graphic Suppier	380

D. The Basic of Printing Education

Printing Education has many literation and resources but limited in human resources as tutor and lecture in specific education background in this industry.

In fact, industry need so many compatible human resources in this industry year by year, because this industry growth together with Indonesian economic growth around 7% yearly. These industries always innovate and develop with technology. Educated

Fig.1　Printing methods

human resource is needed. This paper describes what is printing and explain why this industry related with human being very closed and they have high dependency on it.
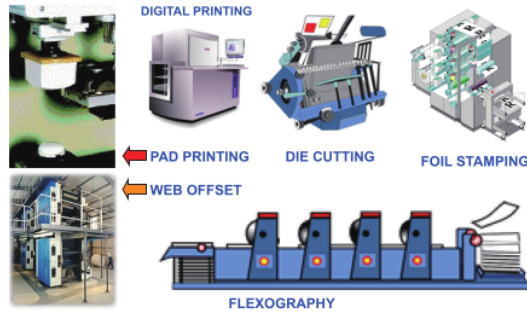

Fig.2   Printing methods basic

That figure explained the printing method in basic. It was growth from conventional technology until high tech technology. People couldn' t work based on experiences only without any basic education. Today all human resources on this industry must be trained with well-educated background. Some companies sometimes didn' t realize with this. The market request the company must provide high quality product, the solution very simple buy high tech machine too but poor in human resources. The effect is high tech machine product similar with old and cheap machine.

E. Four Core Components in Printing Industry

In printing industry, there are four-core components that must pay attention in printing industry, technology investment cannot give warranty could print in high quality. In order to develop high quality print, the industry must concern with core key four factors. Human is high priority number one, human must skilled and have good education in printing. Being specialized in this industry. Human resources is vital, although the industry have health capital, high technology, good quality in materials but lack of expert in human resources, it will waste and useless investments. These tables below explain each critical point of core key four factors.

Printing technologies develop very fast, they innovate all aspects in order to achieve efficiency and effective goals. Today technology drives all sectors in industry. Educated human resources in this industry are needed. People must adapt and innovate the

industry through education. In this paper explained how important education in industry, especially printing industry. The development of printing industry also very fast, sometimes the management cannot catch it with existing human resources.

Table 3   Key core four factors in printing industry

| HUMAN	INFORMATION TECHNOLOGY
People is core component in Industry Management, include skills, knowledge and basic education. Education and Knowledge today is important, research ability is a must.	Innovation and Creativity in order to develop the industry, machinery include in this sections, beside machinery, communication way also included.
MATERIALS	CAPITAL
Knowledge in material science that support the industry, such as paper, ink, chemical and etc.	Money Assets Management System
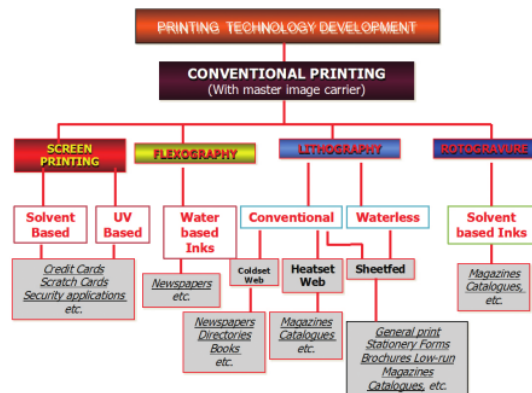
Fig.3   Print technologies

F. Printing Industries Categories

Printing Industry today has many diversifications in core business. In the past only stack printing and conventional screen-printing. Technologies develop and enter all industries infrastructure. Since technology transform this industry business opportunity, the printing industry opportunity become vary and profitable. Printing industry categories divided by four-business category. Print on Demand, Packaging (mass) Printing, News and Publishing, and Security Printing. It described below:

a) Print On Demand
- The design is varied, often personal.
- The quantity relatively large.
- Delivery time is usually short.
- The media can be paper, plastic or cloth.

- Its products include brochures, posters, leaflets, banners, invitations, forms, membership cards, memory book, photos, etc.

This type of machine used:
- Photocopy.
- Digital printing (ink jet, laser jet).
- Screen Printing
- Offset (small and medium size).
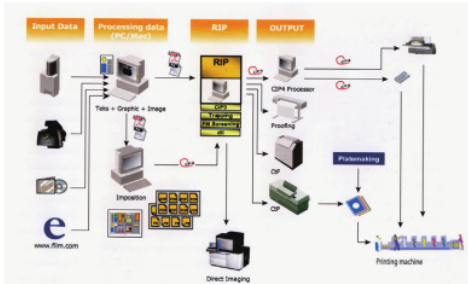- Hot stamping foil, etc.

◆ Print of Demand Workflow System

Fig.4 Print of demand workflow system

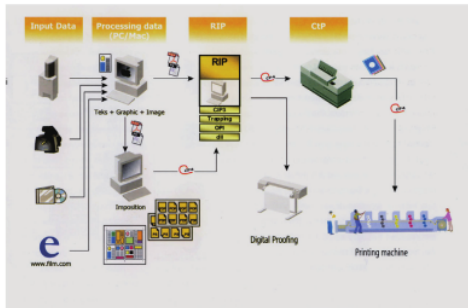◆ Print Of Demand Prepress Workflow Process

Fig.5 Print on demand pre press workflow system

b) Packaging (Mass) Printing.
- A relatively large quantity.
- Print repeated.
- The media can be paper, cardboard, plastic flexible, and so on.
- Delivery time is usually relatively well planned.
- Examples of products include paper packaging, packaging board, corrugated packaging, flexible packaging, notebooks, colored paper, greeting cards / invitations bulk, card games, etc.

This type of machine used:
- Offset (medium, large, web).
- Gravure
- Flexography, etc.

c) News and Publishing
- The printing process related to the issuance.
- Regular printing process.
- The quantity can be relatively large or small.
- Its products are newspapers, magazines, books, prints, etc.
- Printing raw material is paper.

This type of machine used:
- Offset (small, medium, large, web).
- Gravure.
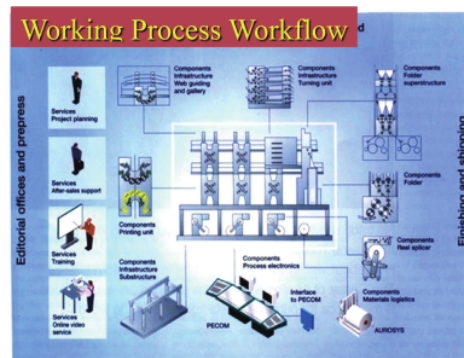- Laser printer.

◆ Newspaper Working Process

Fig.6 Newspaper working process workflow

d) Security Printing
- Printing prioritizing security against counterfeiting.
- Can be integrated with packaging printing and print on demand.
- The media can be paper, plastic.
- Its products include: phone cards, packaging, certificate, commercial paper, money, etc.

This type of machine for security printing:
- Offset.
- Digital printing.
- Laser Engrave (holographic printing) .
- Stamping foil, Screen Printing,
- Gravure, etc.

G. The driving factors for the printing industry

A. The development of printing technology, either pre press – press and post press.

Today technology developing in all industrial sectors, in this case technology in printing industry also growth very fast and changed significantly. Education must be dominated in this area. Uneducated human resources cannot follow and caught the technology development. Skilled worked was needed

since technology revolution in this printing industry. The industry cannot have high dependency only based on experience aspect. Although the industry develops significantly it must parallel with academic side, in order to produce many skilled workers for push the industry itself.

B. An understanding of the added value in packaging design and print quality.

Since Packaging became marketing and promotion tools, it requires print and design in high quality. Technologies also enter in this section kind of color management, dummy proof in order to achieve what you see what you get. The demand on packaging industry also increases significantly with so many product variants. Innovation and Creativity is a must and dominant. Market pushed industry to produce many innovation and creativity in this industry, more interactive packaging occurs in this industry today.

C. The development of indoor and outdoor advertising media.

Other printing industry also develop and create many innovation still in digital printing scope is outdoor and indoor advertising. In the past this industry using conventional screen-printing and air brushed paint, today all enter in digital printing with so many variants could be chosen. This industry now become very competitive industry; especially at Indonesia still booming with technology touch. Lighting industries also enter to this business. Printing product always develop and interactive. Advertising world very competitive industry at Indonesia. Information Technology tend to be leader in this industry too.

D. Demands quality prints.

Printing quality also must be big concern and consideration. Today, this industry market is being smart and knowing high quality product. Low end product nevertheless again people want to play. High Quality product tends to be most secure and efficient in production cost, effective in time. Technologies solve this side with many supported software and hardware. The price itself in high quality printing product is beautiful and profitable. Indonesia Printing Industry changes their point of view in order to enter this product. Investment in technology increase since 2012 because of this, Indonesian printing industries increase for the population and the market more competitive.

The needed of the skill worker and educated worker increase too. Printing Company tend to change their management by recruit new worker who has background in printing, be specialized. From the operator position until managerial level position,

academic must support this change by provide skill worker (vocational school).

E. Environmental awareness.

Go Green issues make change this industry too, using paper based on wood decrease change to recycle paper. Paper Mills Industry walking together with printing industry for win-win solution related with this issues.
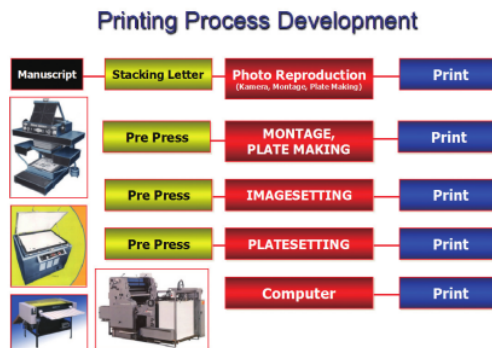
H. Printing Process Development

Fig.7 Printing process development

I. Printing Technology Development
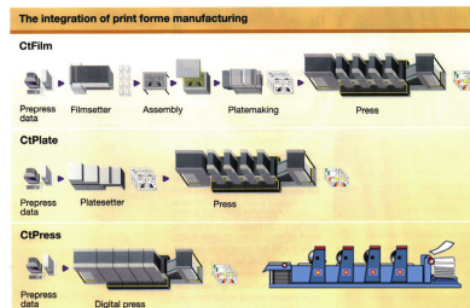### A. Printing Technology Development History

Fig.8 The development of printing technology (Source: Man Roland)

B. Printing Technology Development (Pre Press)

- Computer to plate à Computer to Conventional plate.
- Computer to screen.
- Remote printing (print remotely) .
- Laser Engrave for gravure cylinder.
- Color Management:
  The development of software RIP (Raster Image

Processor).
ICC (International Color Consortium) profile, which connects the digital and conventional techniques.
Color calibration instruments.
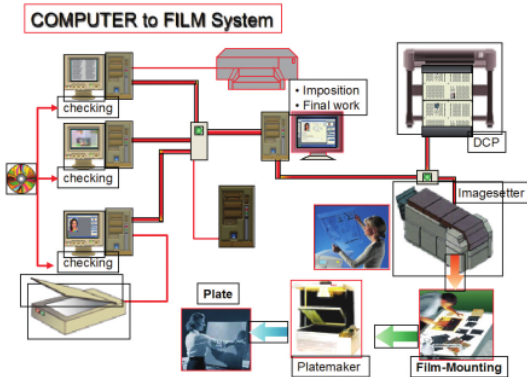
● Computer to Film Workflow

COMPUTER to FILM System

Fig.9   Computer to film system (Pre Press)

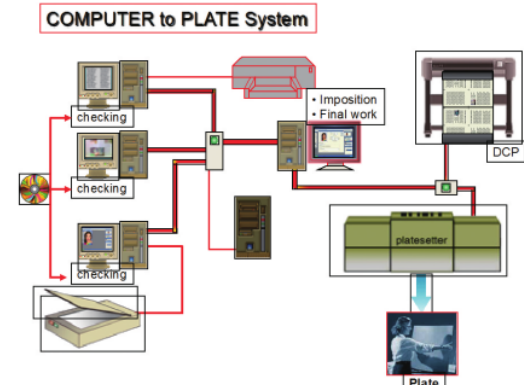● Computer to Plate System

COMPUTER to PLATE System

Fig.10   Computer to plate workflow (Pre Press)

C. Printing Technology Development (Press)

● Digital printing (Large Format Inkjet printers, color laser printers, inkjet ink – waterbase, solvent base, uv ink).
● Large format screen printing.
● "Make Ready" Offset.
● Computerized inking system.
● Flexo printing (packaging, cigarette, cards, etc.) .
● Dry pigment ink raw materials à Flush.
● Hardware color calibration and density.
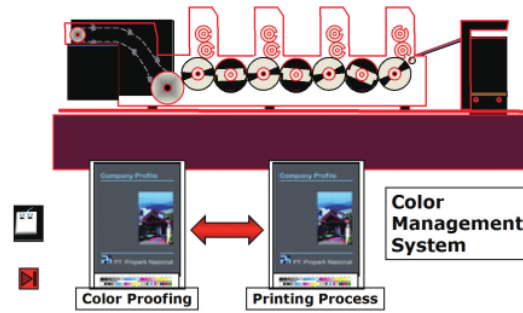● Printing System

Fig.11   Printing technology system
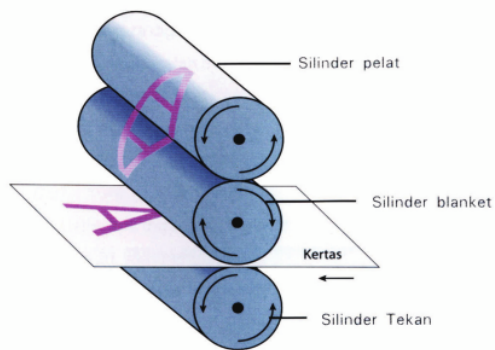
● Printing System Process

Fig.12   Printing system process
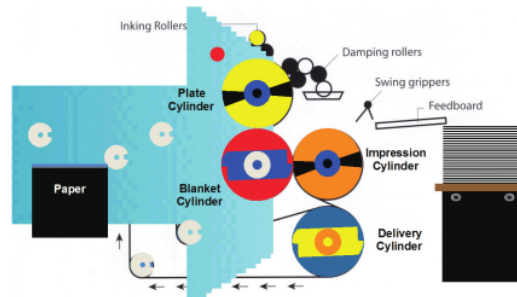
● Printing Process Workflow

Fig.13   Printing system

● Printing Plan Management with Information Technology System

Printing Plan Management today working with integrated information technology system. Today many industries cannot avoid it. IT Based make the communication and control system much more efficient and effective. The communication among

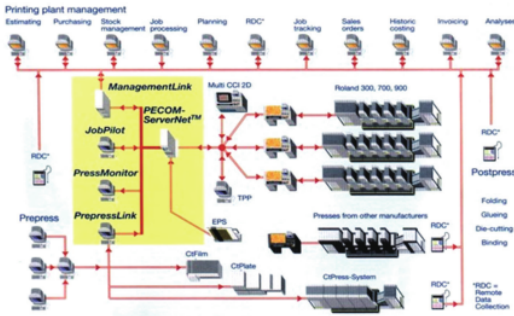each department, possible to make total management workflow running fast.

Fig.14   Printing plan management with IT implementation (Source: KBA)

D. Printing Technology Development (Post Press / Finishing)

- Smart guillotine (intelligent cutting machines) .
- On – line finishing.
- Type varnish, lamination and machining applications.
- Flexible packaging types and media intermediary (adhesives)
- Hardcover – Chasing In
- High Technology Stitching and Bending

E. Outdoor and Indoor Media Advertisement Development

- Developments Large Format Digital Printers and Large Format Screen Printing encourage outdoor and indoor advertising becomes more interesting and creative.
- Outdoors and indoors advertising media more diverse (backlit, frontlet, non-woven, etc.).
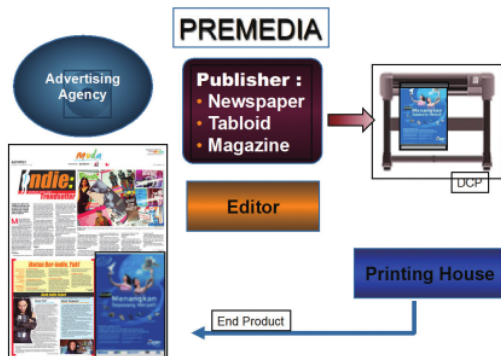
F. Pre Media

Fig.15   Pre media workflow

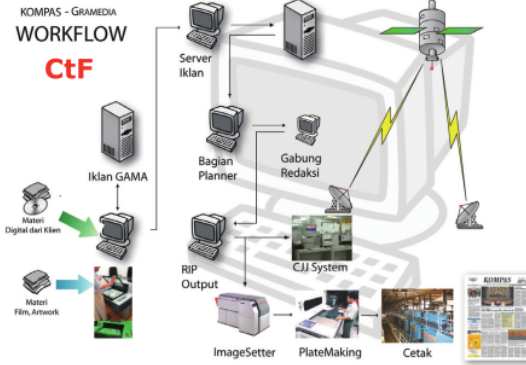

Fig.16   New pre press system in media (Source: Kompas Gramedia)

J. The development of electronic media effect on the print industry, especially advertising and publishing.

- A. Within the development of communication, technology and competition, customer more choice.
- B. Poor print quality and cost into consideration.
- C. Competences of human resources become the primary choice in the graphics industry.
- D. The labor force in printing / graphics increases.
- E. Top Quality Raw Materials of particular concern especially over the issue of paper go green, so look for alternative materials paper quality is not declining
- F. The quality of the main raw materials increasingly high demands such as ink, etc.

K. Vocational Education

- A. Preparing human resources to implement printing technology.
- B. In cooperation with a large and reputable printing industry for internship students. (Link & Match)
- C. Making the best students in the areas under their control.
- D. Preparing capable human resources who are ready to work.
- E. Prints and evoke a spirit entrepreneur for the students.

L. Technology and Management of Graphics Development on IT Based

a. Design

In the past, design or retouch division using film and manual models, since technologies enter this division they develop not only in design itself also software and hardware include it. This division function is

- Design
- Scanning
- Layout
- Software that used in this division
  - PageMaker
  - InDesign
  - Illustrator
  - Photoshop
  - Acrobat
  - Frame maker
  - Quack Xpress
  - Corel Draw
  - Freehand
  - Etc.

From the basic software, today also develop color management software too that help the desk possible to achieve What You See What You Get. Information Technology help the production too with calibration in order to reduce time for ready and waste.

b. Pre Press

From design goes to Pre Press, pre press is kind of department that make preparation due printing process. In this department making color adjustment and final checking due to CTP Process and Printing process. Publishing or Commercial have high dependency with this department to achieve high quality of print results. Design section only design not control about the pre press in depth. Pre press is the important key in all-printing process totally.
This department divided into some functions:

A. Publishing / Commercials

- Publishing/Commercial workflow systems (Calibration and Setting) .
- Advertising (Orders, Digital Workflow)
- Plan Pages (Production planning, ad disposition, editorial, page dummying before final print, page assembly, output control for CTF and CTP.
- Articles (Page Layout, archive, creative and creation).
- Scanning (Imposition, trapping, color separation, color management, photo graphics).

- Digital Print from (PDF/TIFF workflow, image setting, plate setting, punching and proofing.
- Film and Plate Making.

B. Pre Press (Photo Reproduction)

- Retouching
- Stripping
- Montage
- Screening
- Positive Film Process
- Negative Film Process
- Positive Plate Process
- Negative Plate Process

C. Pre Press (Other Services)

- Typesetting
- Photo Reproduction B/W, Positive and Negative.
- Montage
- Image setting・Film
- Plate Setting・Plate
- Film Making
- Plate Making

D. Pre Press – CTF – CTP

- Image Setting:
  - Computer to Film
    - Positive Film Process
    - Negative Film Process
    - Punching
  - Computer to Plate
    - Positive Plate Process
    - Negative Plate Process
    - Punching

c. Press

After the process design and pre press final finished, next process is press. Press also divided into some techniques and function. Although in the design and pre press is same. In the press could be different and vary. Offset Press divided into Web Printing and Sheet Fed Printing both water based system.

- Web Printing
  - Broadsheet (Newspaper)
  - Tabloid
  - Magazine
  - Book
  - Digest (Quarter Fold size)
- Sheet Fed Printing
  - Tabloid
  - Magazine (usually exclusive edition) .
  - Commercial Book
  - Book Cover
  - Card, Ticket
  - Calendars
  - Poster and Leaflet

○ Brochure

d. Labeling

Labeling is specific print using rotogravure or Flexo, this technique usually mass production with huge quantity. This technique different with offset but similar system. Labeling usually use for flexible packaging, such as bottling brand, cosmetic packaging, etc. Labeling workflow process providing

- Design → Imposition
- Label Sheet Layout in detail and precision
- Color Management, Color Setting, and calibration. In this business color is absolute perfect, especially related with company color or brand color.
- Printing Process → it must well calibrate with the pre press. *What You See What You Get* must achieve.
- Die Cutting → with high precision, usually for form labeling.
- Proofing Color Match
- Gluing process.

e. Packaging

Packaging is the technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of designing, evaluating, and producing packages. Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use. Packaging contains, protects, preserves, transports, informs, and sells. In many countries it is fully integrated into government, business, institutional, industrial, and personal use.

The purposes of packaging and package

Packaging and package labeling have several

- Physical protection – The objects enclosed in the package may require protection from, among other things, mechanical shock, vibration, electrostatic discharge, compression, temperature, etc.
- Barrier protection – A barrier to oxygen, water vapor, dust, etc., is often required. Permeation is a critical factor in design. Some packages contain desiccants or oxygen absorbers to help extend shelf life. Modified atmospheres or controlled atmospheres are also maintained in some food packages. Keeping the contents clean, fresh, sterile and safe for the duration of the intended shelf life is a primary function. A barrier is also implemented in cases where segregation of two materials prior to end use is required, as in the case of special paints, glues, medical fluids, etc. At the consumer end, the packaging barrier is broken or measured amounts of material are removed for mixing and subsequent end use.

- Containment or agglomeration – Small objects are typically grouped together in one package for reasons of storage and selling efficiency. For example, a single box of 1000 pencils requires less physical handling than 1000 single pencils. Liquids, powders, and granular materials need containment.
- Information transmission – Packages and labels communicate how to use, transport, recycle, or dispose of the package or product. With pharmaceuticals, food, medical, and chemical products, some types of information are required by government legislation. Some packages and labels also are used for track and trace purposes. Most items include their serial and lot numbers on the packaging, and in the case of food products, medicine, and some chemicals the packaging often contains an expiry/best-before date, usually in a shorthand form. Packages may indicate their construction material with a symbol.
- Marketing – Packaging and labels can be use by marketers to encourage potential buyers to purchase a product. Package graphic design and physical design have been important and constantly evolving phenomena for several decades. Marketing communications and graphic design is applied to the surface of the package and often to the point of sale display. Most packaging is designed to reflect the brand's message and identity.
- Security – Packaging can play an important role in reducing the security risks of shipment. Packages can be made with improved tamper resistance to deter manipulation and they can also have tamper-evident features indicating that tampering has taken place. Packages can be engineered to help reduce the risks of package pilferage or the theft and resale of products: Some package constructions are more resistant to pilferage than other types, and some have pilfer-indicating seals. Counterfeit consumer goods, unauthorized sales (diversion) , material substitution and tampering can all be minimized or prevented with such anti-counterfeiting technologies. Packages may include authentication seals and use security printing to help indicate that the package and contents are not counterfeit. Packages also can include anti-theft devices such as dye-packs, RFID tags, or electronic article surveillance tags that can be activated or detected by devices at exit points and require specialized tools to deactivate. Using packaging in

this way is a means of retail loss prevention.

● **Convenience** – Packages can have features that add convenience in distribution, handling, stacking, display, sale, opening, reclosing, using, dispensing, reusing, recycling, and ease of disposal

● **Portion control** – Single serving or single dosage packaging has a precise amount of contents to control usage. Bulk commodities (such as salt) can be divided into packages that are a more suitable size for individual households. It also aids the control of inventory: selling sealed one-liter bottles of milk, rather than having people bring their own bottles to fill themselves.

Packaging types

Various types of household packaging for foods

Packaging may be of several different types. For example, a **transport package or distribution package** can be the shipping container used to ship, store, and handle the product or inner packages. Some identify a **consumer package** as one that is directed toward a consumer or household.

Packaging may be described in relation to the type of product being packaged: medical device packaging, bulk chemical packaging, over-the-counter drug packaging, retail food packaging, military materiel packaging, pharmaceutical packaging, etc.

It is sometimes convenient to categorize packages by layer or function: "primary", "secondary", etc.

● Primary packaging is the material that first envelops the product and holds it. This usually is the smallest unit of distribution or use and is the package that is in direct contact with the contents.

● Secondary packaging is outside the primary packaging, and may be used to prevent pilferage or to group primary packages together.

● Tertiary or transit packaging is used for bulk handling, warehouse storage and transport shipping. The most common form is a palletized unit load that packs tightly into containers.

These broad categories can be somewhat arbitrary. For example, depending on the use, a shrink-wrap can be primary packaging when applied directly to the product, secondary packaging when used to combine smaller packages, or tertiary packaging when used to facilitate some types of distribution, such as to affix a number of cartons on a pallet.

Packaging production process has high critical and difficulties level that must be high concern on it. Each packaging has different qualification based on used for. Food Grade, Medicine Grade, Electronic Grade, Common Grade, and Transportation Grade. Each grade also has differences too in material. In the printing process color also must be high attention. Color matter is very sensitive matter related with fake or hijacked product. It must have special treatment on it for security. Usually material that used for packaging is vinyl, plastic, paper; metalize paper, box cartoon and flexible. This packaging production has step for production.

● Design → Imposition
● Box Sheet Layout → Packaging Form
● Color Setting and Calibration
● Printing Process
● Die Cutting → related with precision and detailed of packaging form.
● Color Proofing and Form Proofing by make up.
● Folding and Gluing.

f. Post Press

This process usually for book finishing and packaging, end process but need detailed work. This process if uncontrolled or with weak QC will be destroyed total product. Although the print process achieve target but the post press production weak, it will useless. This process provided

● Paper Handling System
● Folding
● Cutting (Guillotine)
● Perfect Binding → Book
● Stitching Machine → Book
● Three Knife Trimmer → Book
● Overhead / Gripper Conveyer
● Trimming Line
● Compensating Stacker
● Inserting Machine / Filler
● Bundle Addressing System → Delivery
● Strapping Machine
● Handling Module
● Palletizing Automatication
● Die Cutter
● Pre-Feeder
● Folding Carton Gluer
● Folding Carton Packer

g. Control Software

Since IT Development enters and makes innovation in this industry, everything seems easy to control and trace ability could optimal. All process could be easily to monitor and control. Time consuming and waste energy and product possible to be eliminate with IT approach. Human Resources tend to learn IT for innovation on product. Old model has been left because of efficiency and effectively working space environment. In the future a printing house no need

many peoples to run it, all controllable by IT and Software. What kind software that must used in this industry? Usually they used common software but all must calibrate. The software that common used is:

- Adobe
  - Photoshop
  - Acrobat
  - In Design
  - Illustrator
  - Page Maker
  - Frame Maker
- Quark Xpress
- Corel Draw
- Editorial System
- Color Management Software
- Calibration Software
- Free Hand

h. Supported Peripheral

What kind peripheral that used? Usually all working station models could be used with specific requirements. Gamers specification same with Design Specification. However, based on standard of printing, Apple Product is recommended.

i. Consumables

This is kinds of product materials that support and basic material for each process. Logistic department should provide with good quality. The quality of the materials will give direct impact to product quality. Please be ware on it. For Examples

- Films
- Plates
- Blankets
- Inks
- Dampening Solution
- Gloss, Varnish
- Papers
- Coated Wood Free Paper · Recycle Paper

M. Media Management with IT Implementation

Fig.17 Media management with IT implementation

Media Management also transform into IT Based,

they need innovation and development in quality, time and efficiency. IT dominant in all industries, it must parallel with academic and education. Today SMART HR is needed. Industry cannot avoid it, they need smart human resources, Education is important in all industrial sectors. In order to achievement this goals, Government, Industry and Academic must walking parallel. Education will pushed the industry more innovative and creative, then government supports it.

This paper describe and explain how important of Printing Science Technology Education. Human Resource is key for the success of a printing company. Increasing Printing Science Technology Education it must parallel between academic (university) and industry (factory teaching). Basically between Theory and Practical is one bundle. Vocational education could be well developed if they apply 2 models of teaching, **Factory Teaching and Academic Teaching Models**. We did this research since 2012 and the result the model must be mixed.

CONCLUSION

1. Graphic products were needed every day in human life. Printing Industry will never die. It always innovates and develops.
2. Graphics technology continues to evolve at any time.
3. Flourishing printing industry in Indonesia. It proven by the increase of paper mills industry and market.
4. The world of work in the field of graphics is wide open.
5. The necessary human resources with competence in the field of engineering graphics, graphics management, and other matters related to graphics.
6. Education in Printing is a must, with technology innovation and development. Industry must drive by education, not education drive by industry. Competency and Skill should be part of consideration at this industry.
7. Eliminating gap between technology development and education, it must run parallel.
8. Government must support this changes. Although the industry growth, technology also growth, smart human resources increased but it will nothing without government's intervention for controlling function.
9. Factory Teaching (Industry) and Academic Teaching (University) must working parallel in order to prepare and produce skill worker human resources. High dependency only from Academic it's impossible to create it. University and Industry

must working and walking together and give teaching methods parallel.

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