

# The Political Advertising of Women'S Skin Colours in Indonesia

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## Abstract

The beauty of the woman is form a stereotype (*uniformity*) and bring them to the properties in the surrounding of beauty. Among other things, women have to look charming, a clever housekeeping, smart and a source of knowledge and moral of her families. Women are also often referred to a gentle, graceful, a good cook, more emotional, less physically strong, motherhood, dependent, and passive figure. Discourse beauty and femininity of women can not be separated from the construction of a patriarchal culture that gave power to men to provide for recognition of women's femininity on the one hand, and women are always looking for the recognition of male femininity. And so does the women that's using by the advertisement. Using a socio-cultural approach, the authors will examine changing trends unique beauty of Indonesian women by socio-cultural background that developed in Indonesia. Beauty trend women are generally more influenced by the socio-cultural background of a society. That's factor influence social and cultural change will also be examined, primarily concerned with changes in women's attitudes, the emancipation of women, the development of technology, and the influence of western culture against the culture of Indonesian women. Trend deconstructed female beauty through the mass media today. Women are encouraged to grow awareness that she did not beautiful if they do not have the requisite gorgeous beauty same in the mass media. The mass media had been dictating our consciousness both individually and collectively on lifestyle, as well as the meaning of social and cultural values.

**Keywords:** Beauty, Women, Advertising

## 1. Introduction

In everyday life, many women used and involved in advertising, even the use and involvement of women in advertising is pretty much done in the early 1970s, it is based on records Sita Van Bammelen (1992). (Rendra Widyatama, 2005; 42). The involvement of women is based on two main factors: first that the woman is a very large target market for the product in the industry. In fact more industrial products created for women. For example, is a personal care products, for men products are intended for personal care products is not as much devoted to women. Thousands of cosmetics created for women, it is not surprising that, in turn, women have always been become a targeted of advertising. The second factor is that women are believed can strengthen the advertising message.

Previously, the beauty of a woman is always identified with the age, body shape, skin color and so on. It also deals with the myth/ standard of beauty that is grown in the community, in the early 1990's, for example a women called a beautiful women when she has an ideal body shape, slim, fair-skinned, and long hair. The beauty myth now has changed, in the year 2000 the standard of beauty changed again, advertisers began to dare to display the model with brown skin color, even using black skin models. This is because the brown /tanned skin is a symbol of high social economic because it illustrates that the women are able to go vacation to exotic/tropical areas in abroad. But, now began there is awareness on women in particular that the ideal woman is a woman who has the self-awareness to love and accept themselves for what they are. Beauty myths prevailing in the society in general is controlled by economic factors, rather than by cultural factors, advertising also played a role in it, an advertising can influence people's perception about the true meaning of beautiful, which in turn will change the beauty myth in society. Hence today many advertisements cosmetics / personal care for women in particular, they tried to create the myth of beauty that is becoming a trend nowadays. (Naomi Wolf, 2005; 63). Naomi Wolf, in her book, "*Mitos Kecantikan, Kala Kecantikan Menindas Perempuan*", raised an issue about women's acceptable losses due to the beauty myth. According to her, the beauty myth has surrounded the women, in all areas of women's lives. As a western feminist, Naomi Wolf perceive feminism there is a 'war' over imperial masculine and patriarchal culture. Beauty Myth, according to Wolf, has created a category or qualification of 'pretty', which must be accepted given, (given) by a female. Wolf also trying to raise awareness about the concept of beautiful women. According to her, women will always be beautiful with or without the beauty myth. Women should be able to distinguish between myth and what is actually being outside. Women should have an independent stance on feminine identity. Beauty myth would be a women's major, as long as women are still feel bad of her self. According to Wolf, the beauty myth is not going to mean anything, because she's actually really pretty. Naomi Wolf also clearly explain how it should be the attitude of women free of the beauty myth. In

addition, women should also be able to emphasize the aspect of independence, equality, independencies women, determine the right choice, and conduct political meaning. Naomi Wolf writes, "Women will be free from the myth of beauty when we can choose to use a facial, body and clothing as a simple form of self-expression of many other sphere of self-expression. We can dress up for fun ourselves, but we have to keep fighting for our rights." (Naomi Wolf, 2005; 550).

Based on the opinions of Naomi Wolf, it seems clear that the woman should be the one who controls the meaning of beauty in force in his life, but it is contrary to the conditions or situations that developed at this time, the women seems controlled by the manufacturers and advertisers of goods especially cosmetic products even they make it as a trend that must be followed by the women. There seems to be coercion / reinforcement of the producers and advertisers to provide or incorporate trend. The presence of female public figures also helped reinforce this trend, for example, a black singer Anggun now become a model from advertising shampoo to toothpaste advertising, Farah Queen a chef and a presenter is now co-starring in various commercials advertising. From overseas, Miss Universe 2011, Leila Lopes who have a black skin stared You C 1000 advertisement for Indonesia. The things mentioned above seem only a fraction of the strategies used by producers and advertisers to create the latest trends among women. But at the same time the advertising of whitening products displayed and published in the mass media, both print and electronic media, so there is the phenomenon of "war" between the body whitening products or choose to follow the trend of skin color brown (tanned skin). So there is a "battle" advertising idea, eventually one of the advertising going to hegemonied of ideas the other advertising. And at the end one of the advertising idea will hegemonied another advertising, the one who will hegemonied will be accepted as the ideology of the public/community.

According to Tommy F Awuy, lecturer of Philosophy at the Faculty of Humanities, University of Indonesia, the perception of female beauty always continue to fight in the definition. Whether it's the definition of a dominant culture that tends to versions of patriarchy, industrial version, or in to religion. In the era of consumption, the beauty industry with its capital strength continues to reinforce the definition of beauty compact version to the beauty industrial complex contract. Tommy added, it happens when the definition pretty strong as industry accepted version of reality. If not followed, the women knocked out of the category of women who is considered beautiful by the society. As mentioned in the background of an idea that advertising can also influence the trend of beauty in the society. Therefore, researchers are trying to assess the extent to which the idea of an ad can affect women of the current beauty trends. The author sees advertising strategy on the part of producers and advertisers, arises because of the reason, the reason is what the author will examine in this research. After outlining the background of the problem, then the problem can be identified are the following that the community form the basis / foundation to deliver an advertising idea, so the role of the community is active.

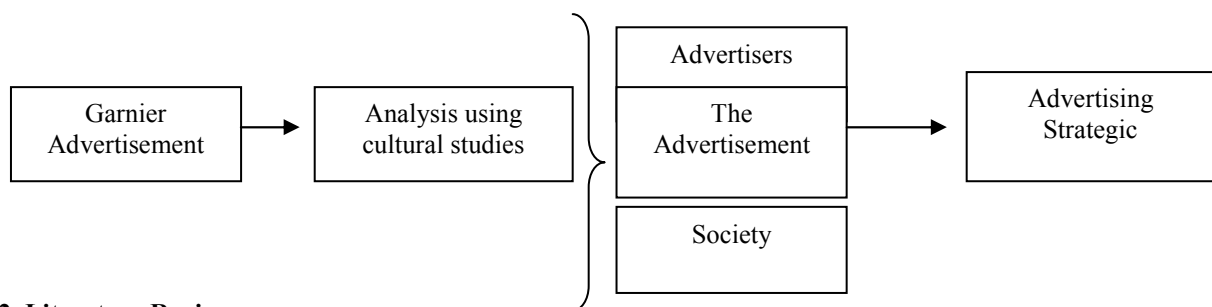
### 1.1 Research Question

Based on the identification of the above issues, the issues that will be examined are as follows: "How is the idea in the advertising that made by an advertisers in creating the ideological trend of women skin colours's?"

### 1.2 Research Method

The research method used in this research is using ethnography qualitative research, this methods are used to describe systematically the facts or specific areas factually and accurately. The approach used in this research is using a cultural study. Cultural study approach was used to analyze the advertisers, advertising (as artifacts), as well as the public or consumers. Cultural studies ethnography focused on the exploration of meaning in the context of "a whole way of life" that the problems of the world of culture and identity of a community life.

### 1.3 Research Process



## 2. Literature Review

### 2.1 The Idea of Advertising

There are three main purposes of advertising are to inform, persuade and remind. The first purpose of advertising, informative advertising, which means that marketers must design the advertisements in such a way that the important things about the products can be delivered in the advertising message. The advertising highlight

aspects of the product benefits are usually categorized as the informative advertising. The message of advertising also usually are informative.

The second purpose of advertising is persuasive advertising plays an important role for companies with a high level of competition. The marketers goals are trying to convince consumers that the brand has to offer is the right choice. The advertising typically contained in persuasive advertising messages comparisons (comparative advertising). Marketers try to compare the advantages of the products offered by other similar products. Consumer products very often used comparison advertising with the aim to persuading the consumers.

The third purpose of advertising is to remind. In general advertising that is reminiscent used for products that are already established and have a specific consumer groups. Products purchased repetitive but with low consumer involvement is very susceptible to advertising messages to compete with other similar products. Many of these products are first established and dominate the market now lost because there was no advertising campaign that is reminiscent. For example, Signal toothpaste once been outstanding and has a particular market segment, but is now lost in the market because there is no one cause that is reminiscent of your advertising efforts. (Sutisna, 2002; 276)

## 2.2 Advertising Strategy

Strategies play a vital role in determining the success of the advertising. Strategy is the foundation of brand building, advertising strategy is keeping marketing elements are in the right track and build brand personality with a clear and consistent. Strategy represents the soul of a brand and a key element for the success of the (Roman Maas & Nisenholtz, 2005; 44). Advertising strategy should be able to answer the basic question of the design of a an advertising campaign that is encapsulated in the 5W + 1H (Suhandang, 2005; 30), such as:

1. **What** : what is the purpose of an advertising?
2. **Who** : who the audience will be reached?
3. **When** : when the advertising will be placed?
4. **Where** : where the advertising will be placed?
5. **Why** : why should do such ?
6. **How** : how to form the advertising?

The purpose of the strategy is an attempt to create an effective advertising, therefore, in addition to the formulation of the question 5W + 1H enough knowledge about the product, the market competition or competitors and a through analysis of the consumer is the key principal that should be known by marketers before formulating a strategy. (Ian Batey, 2003; 65). It includes two things, namely:

### a. *Marketing Brief*

The first thing before the strategy is encapsulated knowledge about the product. Information on products or services to be advertised, which is contained in a marketing brief is made by the client. Such information generally includes:

#### 1. Brand

An explanation of whether the brand is a brand new or old brand that has long existed in the market.

#### 2. Product knowlegde

A brief description of the features contained in the product.

#### 3. Diferencies

Excellence that distinguishes it from competitors.

#### 4. Target audience

Segmentation is meant by a product to be advertised. Which group will be the target market of a product with know the target audience, we can understand how they think, act, and behave.

#### 5. Competitor

What products to competitors of the product to be advertised. From there it can be seen what is the advantages and disadvantages of the product to be advertised and competitor products. can also see what the final ad of the competitors.

### b. *CreativeBrief*

Strategy defined to stimulate the purposes in the creative or creative brief summaries are made to the agency in creating advertising. Summary of creative is a bridge strategy to creative advertising, creative summaries represent the current situation, competition, market conditions and media considerations. The summary of creative was a life strategy and provides important insights for the creative team to set strategy and determine the main idea of the sales, which will be the central theme of the advertising campaign. Each advertising agencies have a summary of creative models vary, depending on the product needs to be advertised. There is no model of marketing that is so rigid that you can not change. No marketing formula that is so tight that any changes are prohibited. Only the guidelines should not be changed while the

strategy of tactical guidance in the form of a summary of creative be changed. The most important thing to be seen in the advertising is a the advantage of consumers or the core idea as a strategy for advertising messages. Effective advertising campaigns play a huge role in achieving the share of mind (mind share) and market share (market share). Effective advertising campaign is an advertising campaign based on the theme of the course. A major theme is known as what to say its an advertisement or the core of the message you want to communicate to an audience. The advertising campaign should be based only on one major theme, because the limitations of human memory. Every day consumers see, read and hear dozens maybe even hundreds of commercials. By using a theme that is likely to remember the message of an ad by the consumer will be much greater than using multiple themes.

Advertising messages should have the power to attract attention, interest, desire, belief and action. Jefkins Frank (Frank Jefkins, 1996; 228) in his book, Advertising explains some advertising copy equipment that can be used as a preparation of the message, which is as follows:

1. Introduction

Introduction is an opening sentence and the introduction of an advertising. Introductory sentence placed on the early rounds as an introduction to the next round. Introduction can be either a cause or a symptom of a phenomenon that continues to result from a problem.

2. Cliche

Cliche are simple words and sometimes uniquely used to attract the attention of consumers. This cliché influence and temptation to invite consumers to follow the contents of the message.

3. Action words

The word is an action verb that is used to provide a certain degree of interests. Usually the action words are words short and aims to provide a trigger to do something or a particular reaction.

4. The word that inspires feelings and fun

This kind of sentence is an adjective, the word that describes and memparkan facts. This sentence describes an event that gives consumers the mental effects such as sadness, frustration, fun, proud, and so forth. Some examples of words that delight the senses and is a wonderful, beautiful, amazing and so on.

5. Abbreviation

The phrase commonly used acronyms in the ads in textual form. The writing stands in contrast to standard sentence writing, because there are syllables omitted to facilitate reading.

6. Grammar and punctuation

Grammar and punctuation (conjunctive) in advertising is sometimes violated grammatical Indonesia. The ads are successful sometimes use the non-standard grammar, meaning everyday language will easily accepted by society, because the language is familiar with the community.

7. Repetition

Repetition is one phrase that is often used to convey a message in an advertisement. Time constraints allow for this, which aims to make consumers remember what is conveyed by the advertisement.

2.3 Advertising Strategic Planning

Strategic planning is the process of identifying problems that can be solved with marketing communications, then set a goal/goals for what you want to achieve, how to achieve goals determine strategies and implement tactics to execute the plan.

If the goal of marketers is to strengthen brand loyalty for its products, the planner can use several strategies. They can create a buyers club. They can use direct marketing to reach consumers on an individual basis. They can use advertising to remind consumers to buy back the brand or use sales promotions to encourage repeat purchases. Different tactics are needed to implement a strategy.

### 3. Discussions

Indonesia is rich with a tradition and culture and influenced the views of women in particular and society in general to the unique beauty of natural women in Indonesia. In the context of femininity and female sexuality in advertising, the female body is constructed to suit the tastes of the market, which in this case is the power of the market to determine whether this form of sexuality or femininity (including beauty, body shape, hair type) is acceptable or not. Women will be free from the myth of beauty when they can choose to use a facial, body and clothing as one of the simplest forms of self-expression of many other sphere of self-expression. We can dress up for fun ourselves, but we have to keep fighting for our rights. (Naomi Wolf, 2005; 550)

The concept of beauty in each area is different, and also the beauty secrets that they have is different too. These is all based on the tribe and race. In Africa, the beauty of women is seen from her lips. Lips referred to as a symbol of the beauty of women in Africa. African women decorate and accentuate her lips in a way that looks sexy and interesting. They put a lipstick to her lips so their lips become wider. The higher their social status, the

more wide the lips they have. While in Japan, Japanese women are beautiful views from her small size, her skin smooth and slender neck. If we look at Japanese women indeed have a slim body, this is because they are have a healthy lifestyle such as regular exercise and eating foods low in fat but high in protein and anti-oxidants. Indonesia is well-known with a sensational natural beauty. Indonesian women using natural herbs as part of beauty treatments on every aspect of her body. Starting from head to toe there is a traditional recipe for a treat. For example, the use of rice scrubs, or masks use fruit. Besides beauty secrets from the outside, women in Indonesia also treat their body using herbs. There are many herbal recipes for women's health. Herbal medicine is a heritage recipe, it is proving medicinal able to keep the immune system and also the skin of women in Indonesia. In addition to physical beauty, the natural beauty of Indonesian women typically reflected in the attitudes and behavior of its characteristic, gentle and friendly. The other side of the beauty of women in Indonesia that Indonesian women are intelligent, agile and have achievements in the international world. It proved a few Indonesian women not just rely on her physical charms are beautiful but stunning perspicacity, make Indonesian women deserve to be appreciated. Many overseas adored with the hospitality the people of Indonesia. Beside of the hospitality and care for the environment, today's there's a lot of evidence that many Indonesian women who participated in building the nation.



Figure 1. Cosmetic Advertising introducing an authentic beauty of Indonesian women



Figure 2. Farah Quinn who has a typical beauty woman of Indonesia, now currently use in television media

The standard of beauty is one tangible example of the value system has changed because of the advertising. In the era of 1960 to the 1970's, a beautiful woman is a person who has a thin body, with black and wavy hair. Ida Royani is one of the icons that describes beautiful women in that era. Standards of beauty changed later. In the year 1980 spearheaded by advertising, beauty changed in the new standard. Those called beautiful women is who have skin is smooth and soft. Construction of a new standard of beauty in such a way is very impressive, making the women follow the advice of advertising. Based on the advertising, women embrace to the new standard of beauty, this is what is meant by the authors that the myth/ standards of beauty are more influenced by

economic factors, rather than by cultural factors, and this is precisely what makes the beauty standards keep changing from time to time.

After the women influenced by the advertising to by make the soften the skin, another advertising which is content the new beauty standard is build. In the 1990s, the advertising delivered the new beauty standards women. Told by an advertising, someone beautiful is they who have the ideal body with curves a clear, white skin, not just smooth and soft. Through a variety of media advertisements, submitted that the skin is smooth and soft portion is not enough to be called as a beautiful woman. The advertising whitening products tries to persuade women to whiten their skin, especially the face. Through advertisements also depicted a beautiful woman is a woman who has white skin, not black skin. Brown-skinned women lack a sense of self-generated, so they would follow the advice of an advertising, that whiten their skin, of course, by using the advertised product. And finally, in the early 2000's to the present, women have constructed the new beauty standard. Advertising many times told that a beautiful woman is a woman who has not only white, but also their skin have to be "glowing". Standards of beauty has become more complicated, full of complex imagination. Standard beauty is no longer just a color change physically from black or brown to white. But from plain white to white shine.

Here's one of the inert nature of female beauty Indonesia, many overseas adored with the hospitality the people of Indonesia. Side of the hospitality and care for the environment is evident that today many Indonesian women who participated in building the nation. So with naturally aware of its unique beauty, the Indonesian women will be freed from the myth of beauty given by the mass media, so that in the end is not just a matter of physical appearance, but also a form of free expression of women's rights in voicing her. Even now the media is siding and further highlight the natural beauty typical of Indonesian women in both television and in advertising.

#### 4. Case



Figure 3. Garnier Light Advertisement

#### Analysis:

In this advertising, the image of the woman who made the model is to represent the brand image or the image of the product being advertised. Underlying theme in this advertising are white discourse. In a study of feminism, the idea of a white woman in a magazine advertisement, making the women look at an image that is "herself" in the future (future self) desired or rather naturalized as desired and preferred. The difference between the present self and the future that is the "fuel" for the cosmetics industry today, including ads that promise the face look whiter 2 levels in 28 days. Through this advertising, obsession to be "self-future" a white, smooth-skinned, and so maintained to ensure the need to "enhance" and "fix" itself can be maintained. So this is make sure it stays open market for the product labeled "bleach".

Female characters that are used in this advertising is an artist, which of course is almost certain that the artist faced pretty / pleasing to the eye. Women who used a model that was playing himself. If we think more logically, of course-skinned woman in the ad because she is a woman from East Asia (Japan, China and Korea). But it used to be worth more than the product, because now there is a shift in the idea of white as seen in many other ads. Originally the "white" is considered desirable and preferred limited as white Caucasian/ European (especially by celebrities). But now there are other forms of white-favored, the white nations of East Asia. Illustration on a white background, emphasized white image you want to appear in the advertising, bright colors that contrast with the white color makes the advertising more interesting and any advertising message will reach the consumer.

## 5. Conclusions

Natural Beauty of Indonesian women are not recognized because women in Indonesia are now busy correcting physical deficiencies to forget their own heritage. Indonesian women should proud in its unique (particular) beauty that is natural because many Indonesian women now have an active role its own beauty and charm that sets it apart from the charm of the beauty of women of other countries. Although we must realize every country has a typical female beauty different course.

So with naturally aware of its unique beauty, the Indonesian women will be freed from the myth of beauty given by the mass media, so that in the end is not just a matter of physical appearance, but also a form of free expression of women's rights in voicing her. Even now the media is siding and further highlight the natural beauty typical of Indonesian women in advertising.

Indonesian women is now widely used in advertising and media, so that the themes in advertising that uses women as subject / object that raised many issues of women emancipation, gender and self awareness.

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## 2. Holonic Manufacturing System (HMS)

"Holonc" is derived from the word "holon" introduced by a Hungarian philosopher Arthur Koestler (1967). The word holon combines the Greek *holos* meaning *whole*, with the suffix *-on* meaning a *particle* or *part*, is used to describe a basic unit of organisation in biological and social systems. Koestler found that fully self-supporting, non-interacting entities did not exist in living organisms as well as social organisations. Consequentially, every identifiable unit of organisation, such as a single cell in an animal or a family unit in a society, is composed of more basic units (e.g. plasma and nucleus, parents and siblings) while at the same time is forming a part of a larger unit of organisation (e.g. a muscle tissue or a community). The other characteristics of holons include:

- As self-reliant units, holons have a degree of independence and handle circumstances and problems on their particular levels of existence without reaching higher level holons for assistance. The self-reliant characteristic ensures that holons are stable, able to survive disturbances.
- Holons receive instruction from and, to a certain extent, be controlled by higher level holons. The subordination to higher level holons ensures the effective operation of the larger whole.
- Holons cooperate with peers in order to organise and reorganise themselves based on mutually acceptable plans. This is for solving any problem or conflict they might encounter from time to time, and ultimately, serving the goals of the larger whole.

### 2.1 Establishment of HMS

Towards achieving a higher level of efficiency and competitiveness in manufacturing operations, the European Community (EC), European Free Trade Association (EFTA), Australia, Canada, Japan, and the United States (US) founded an international collaborative research programme called Intelligent Manufacturing Systems (IMS) in 1993. This programme consists of six major projects, wherein the fifth one is entitled "Holonc Manufacturing Systems: system components of autonomous modules and their distributed control". It is important to emphasise that HMS does not represent a new technology, as it is merely a conceptual modelling approach to connect and make use of existing technologies with human interfaces (McFarlane 1995). HMS became one of the first fully endorsed IMS projects in 1997, and so the International HMS Consortium was formed and dedicated to replicate in manufacturing the strengths that holonic systems provide to living organisms and societies. These holonic strengths encompass stability in the face of disturbances, adaptability and flexibility in the face of change, and

efficient use of available resources. Succinctly, autonomy and cooperation are known as the prime attributes of HMS (Valckenaers *et al.* 1997; Bongaerts 1998).

### 2.2 Applications of HMS

In literature, the concepts of HMS were associated with a myriad of technical measures. McFarlane (1995) stated that a holon is able to detect and diagnose problems internally or by cooperating with neighbouring holons of the same manufacturing unit. Types of holons given include processing holon, negotiation holon, scheduling holon, database holon, input/output holon, tracking holon, etc.; and in his steel mill cooling control problem, five cooling holons were used. Gou *et al.* (1998) created a holonic scheduling model using Lagrangian relaxation for a factory equipped with multiple cells. Arai *et al.* (2001) proposed a new concept “Plug & Produce” on their holonic assembly system to handle three manipulators, one belt-conveyor, and two warehouses for the purpose of meeting unexpected assembly requests. Huang *et al.* (2002) framed a holonic virtual enterprise control consisting of global coordinator and member enterprises to enhance the cost-effectiveness on production planning, resource sharing, and change management. Fletcher & Hughes (2006) discussed the technology and policy challenges to be encountered for introducing holons into factory automation. Leitão & Restivo (2007) presented the Adaptive Holonic Control Architecture (ADACOR) that is able to execute fast rescheduling in line with global optimisation during the intervals of resource breakdown. Lim & Chin (2011) devised the Holonic Workforce Allocation Model (HWM) which makes collective operator-task matching decisions based on the operator skill and task urgency parameters, in consideration of specialisation requirements as well as cross-training opportunities.

In the realm of academic management, Karapetrovic & Willborn (1999) constructed a holonic model for quality systems in higher education as to implementing ISO 9000 international standards. Their model contains a set of seven holons to carry out parallel series of tasks on documenting a service organisation. Bell *et al.* (2000) proposed a “holon planning and costing framework” based on system dynamics (SD) and soft systems thinking (SST) to assist in improving the teaching and research qualities given the cost constraints. Montilva *et al.* (2010) used the combination of holonic networks and business models to design an academic organisation devoted to professional training programmes (PTP) on software engineering.

Despite the flourishing research works listed above, the extension of HMS on the subject of labour planning is barely seen. As the gap in the literature is addressed, this paper intends to formulate a holonic model called Workforce Sizing Plan (WOZIP), which is particularly suitable for job-shop production.

## 3. Workforce Sizing Plan (WOZIP)

Job-shop production refers to a manufacturing environment that produces goods in small batches according to customer specifications. Usually, one or several types of products are deliverable, while the incoming orders may differ in the design, quantity, process flow, or urgency (Henrich 2005). Flexibility is allowed in terms of switching between machines, methods, and resolving problems in production. Depending on the nature of business, each of the workers hired may need to possess a certain range of skills to handle different tasks or machines, whereas the total number of workers may be adjusted in response to the varying demand. In practice, transferability of permanent workers and recruitment of temporary or contract workers will help make such adjustment feasible, thus admitting of the idea of WOZIP.

### 3.1 Required Data Input

The utilisation rate of machines in a period of time,  $U_t$ , can be calculated as the total processing time,  $t_{pro}$ , over the duration of periodical review,  $t_{rev}$ , and the number of machines,  $N_M$ , on the shop floor:

$$U_t = \frac{\sum_i t_{pro,i}}{t_{rev} N_M} \quad (1)$$

As mentioned earlier, absenteeism and turnover are identified as the two major problems leading to workforce disturbance. Each type of disturbance can be quantified by its frequency and intensity of occurrence. The frequency,  $f$ , ascribes to how often it occurs over a period of time (e.g. one turnover in a month), whereas the intensity,  $\bar{t}$ , refers to the average duration it has occupied (e.g. absent for two days). With the subscript *Abs* for absence and *Tnv* for turnover, the collective disturbance rate for a period of time,  $\delta_t$ , is hence computed as:

$$\delta_t = \frac{f_{Abs} \bar{t}_{Abs} + f_{Tnv} \bar{t}_{Tnv}}{N_W} \quad (2)$$

Where,  $N_W$  represents the number of workers in total.

The other piece of information concerned is the idling time spent by worker  $j$ ,  $t_{idl,j}$ , which indicates the degree of underutilisation of human resources. The idling rate for a period of time,  $\chi_t$ , is shown below:



$$\chi_t = \frac{\sum_j t_{idl,j}}{t_{rev} N_W} \quad (3)$$

### 3.2 Forecasting and Sizing

This section relates to the data output stage. In order to labour redundancy besides negating the adverse effects of turnover and absenteeism, WOZIP is meant to estimate the number of workers for a production period based on the utilisation, disturbance, and idling rates acquired from the past period  $t-1$  by the Equations (1) to (3). Exponential smoothing, a common forecasting technique in operations management, is used to find the  $U_t$ ,  $\delta_t$ , and  $\chi_t$  rates for the coming period. The general formula for exponential smoothing:

$$F_t = F_{t-1} + \alpha (Y_{t-1} - F_{t-1}) \quad (4)$$

Where,  $F$  and  $Y$  respectively denote the forecast value and the actual value of each variable considered, and the symbol  $\alpha$  is the user-defined smoothing constant.

To compute the workforce size required in the coming period, the formula is composed of the number of working machines, the three parameters stated above, and the user-defined maximum utilisation,  $U_{mac}$ :

$$N_{W,t} = N_M \left( \frac{U_t + \delta_t}{U_{max}} - \chi_t \right) \quad (5)$$

On a monthly basis, a numerical example is given. Let the smoothing constant be 0.30, the forecast utilisation in January be 0.80, and its actual rate be 0.75. As a result, the forecast utilisation rate for February is  $U_{Feb} = 0.80 + 0.30(0.75 - 0.80) = 0.79$ . The same calculation applies to the disturbance as well as the idling rate. In the case of  $U_{mac} = 0.80$ ,  $N_M = 10$ , and the other variables showing  $\delta_t = 0.05$  and  $\chi_t = 0.17$ , the Equation (5) will give  $N_{W,Feb} = 8.84$ , approximate to integer 9. This means, the month of February requires nine operators, by estimate, to run the ten machines on the production floor.

### 3.3 Holonic Architecture

“Architecture” means the art and science of building. A system or functional structure built up with holons is known as “holarchy”, wherein the basic rules for the cooperation and limited autonomy of holons are expressed. Van Brussel *et al.* (1998) made a reference architecture called Product-Resource-Order-Staff Architecture (PROSA), whereby the HMS building blocks were categorised into three basic types of holons, namely product holon, resource holon, and order holon. In their respective functions, an order holon represents the customer order or demand information; a resource holon offers the handling as well as production capacity to fulfil the order received; a product holon holds the process and knowledge to assure the correct making of the product or decision. With this end in view, a holon can be a machine tool, a robot, a human worker, or a planning unit. Every holon must consist of an information processing part in association with the physical processing part of its own or its counterparts under the same holarchy. According to Rodriguez (2005), every holarchy is a moderated group, in which the supra-holon is the representative or moderator of the group as well as a part of the vivid interface in coordination with the local environment; meanwhile, each of the sub-holons has to play at least one role to secure its status in the supra-holon composition.

For the architecture of WOZIP, a holarchy consisting of machinery holon (MH), operational holon (OH), forecasting holon (FH), and sizing holon (ZH) is delineated in Figure 1. The WOZIP is itself regarded as the supra-holon, which allows and coordinates the information transfer as well as the interactive computing between the four sub-holons. In the normal process flow, MH (i.e. the order holon) will supply the work information based on customer specifications for OH (i.e. the resource holon) to prepare the workforce that will handle the machines. At the threshold of workforce sizing, both the MH and OH, which compose the input holon, will generate their respective data items via Equations (1) to (3), for the use of FH (i.e. the intermediate product holon) to conduct the exponential smoothing. The forecast outcomes of Equation (4) of FH will be channelled into ZH (i.e. the final product holon), which completes the procedure using Equation (5) — adjust the workforce size of OH. Essentially, the FH and ZH belong to the output holon. Some negotiation might take place around the beginning and the end of the process flow, between the MH and the customer side (i.e. the external environment) as well as between the ZH and the human resources division (i.e. the internal environment). As the whole process will repeat for every production period, a database has to be integrated into each of the holons for efficient information storage and retrieval.

## 5. Conclusion

A functional structure made up of holons is called holarchy. The holons, in coordination with the local environment, function as autonomous wholes in supra-ordination to their parts, while as dependent parts in subordination to their higher level controllers. When setting up the WOZIP, holonic attributes such as autonomy and cooperation must have been integrated into its relevant components. The computational scheme for WOZIP

is novel as it makes use of several manufacturing parameters: utilisation, disturbance, and idleness. These variables were at first separately forecasted by means of exponential smoothing, and then conjointly formulated with two constant parameters, namely the number of machines and their maximum utilisation. As validated through mock-up data analysis, the practicability of WOZIP is encouraging and promising. Suggested future works include developing a software package to facilitate the WOZIP data input and conversion processes, exploring the use of WOZIP in the other forms of labour-intensive manufacturing (e.g. flow-line production and work-cell assembly), and attaching a costing framework to determine the specific cost of each resource or to help minimise the aggregate cost of production.

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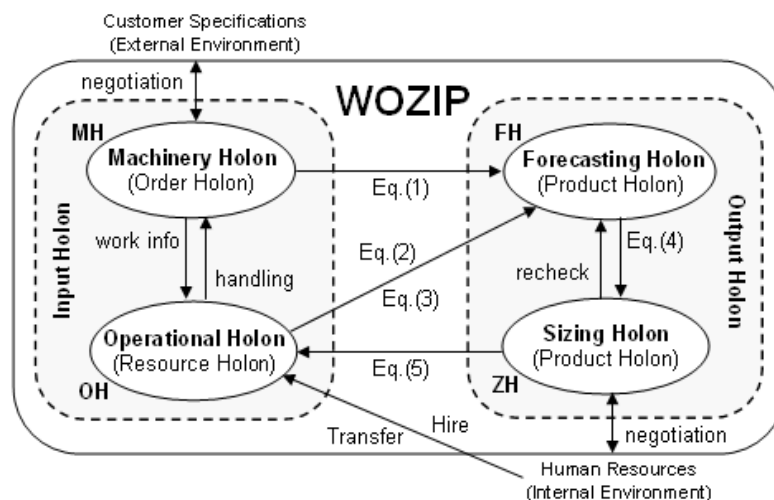


Figure 1. Architecture of WOZIP

Table 1. Datasheet of Mock-up Test

		Number of Machines, $N_M = 10$ Maximum Utilisation, $U_{max} = 0.80$ Smoothing Constant, $\alpha = 0.30$						F = forecast rate Y = actual rate		
Year	Month	Rate						No. of Workers	Remarks	
		Utilisation		Disturbance		Idling				
		F	Y	F	Y	F	Y			
1	Jan	0.80	0.75	0.06	0.04	0.15	0.20	<b>9.25 (9)</b>	lower $\delta_t$  decreasing $U_t$  increasing $\chi_t$	
	Feb	0.79	0.70	0.05	0.07	0.17	0.23	<b>8.84 (9)</b>		
	Mar	0.76	0.66	0.06	0.09	0.18	0.25	<b>8.38 (8)</b>		
	Apr	0.73	0.60	0.07	0.11	0.20	0.26	<b>7.93 (8)</b>		
	May	0.69	0.55	0.08	0.09	0.22	0.28	<b>7.43 (7)</b>		
	Jun	0.65	0.49	0.08	0.12	0.24	0.28	<b>6.76 (7)</b>		
	Jul	0.60	0.43	0.09	0.10	0.25	0.30	<b>6.18 (6)</b>		
	Aug	0.55	0.39	0.10	0.08	0.27	0.30	<b>5.42 (5)</b>		
	Sep	0.50	0.34	0.09	0.05	0.28	0.32	<b>4.65 (5)</b>		
	Oct	0.45	0.30	0.08	0.04	0.29	0.32	<b>3.76 (4)</b>		
	Nov	0.41	0.25	0.07	0.08	0.30	0.33	<b>2.95 (3)</b>		
	Dec	0.36	0.23	0.07	0.12	0.31	0.30	<b>2.31 (2)</b>		
2	Jan	0.32	0.28	0.09	0.15	0.31	0.26	<b>2.03 (2)</b>	higher $\delta_t$  increasing $U_t$  decreasing $\chi_t$	
	Feb	0.31	0.33	0.11	0.18	0.29	0.24	<b>2.25 (2)</b>		
	Mar	0.32	0.41	0.13	0.20	0.28	0.22	<b>2.77 (3)</b>		
	Apr	0.34	0.45	0.15	0.18	0.26	0.20	<b>3.57 (4)</b>		
	May	0.38	0.53	0.16	0.17	0.24	0.16	<b>4.26 (4)</b>		
	Jun	0.42	0.62	0.16	0.12	0.22	0.14	<b>5.13 (5)</b>		
	Jul	0.48	0.69	0.15	0.16	0.19	0.12	<b>5.94 (6)</b>		
	Aug	0.54	0.74	0.15	0.20	0.17	0.09	<b>6.99 (7)</b>		
	Sep	0.60	0.82	0.17	0.17	0.15	0.06	<b>8.15 (8)</b>		
	Oct	0.67	0.87	0.17	0.12	0.12	0.04	<b>9.24 (9)</b>		
	Nov	0.73	0.90	0.15	0.12	0.10	0.03	<b>10.06 (10)</b>		
	Dec	0.78	0.90	0.14	0.15	0.08	0.03	<b>10.77 (11)</b>		

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