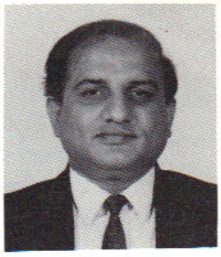
ON THE NEED FOR PROFESSIONAL DESIGN MANAGEMENT

By Dr. K. Venuvinod Patri



INTRODUCTION

Recent statistics [1] indicate that the productivity of Hong Kong's industrial sector is about 2.5 times lower than that in its services sector. More importantly, whereas we fare quite well in terms of the productivity of our services sector, our industrial productivity is substantially lower than that of our major competitors.

Interestingly, this situation is obtained despite the fact that we possess many of the ingredients which are essential for sustaining significant productivity improvements, viz, a hard-working and disciplined labour force, good communications and a well developed capital market. Clearly, then, our poor industrial performance must be a result of some fundamental faults within our industrial structure. This article is based on the hypothesis that the current lack of emphasis on 'product innovation and design' as a significant strategic component in our industrial activity constitutes one such fundamental fault.

WHY A SHIFT TOWARDS DESIGNING IS NEEDED

It has often been said that Hong Kong is a 'manufacturing society' and not a 'designing society'. Although this characteristic has enabled the development of a sound industrial base, it is unlikely to sustain our future competitiveness and growth. This point has been underscored in a recent Consultant's Report instituted by the Department of Industry [1], where it was concluded that "Hong Kong has no future as a low-cost, offshore manufacturing base for mature products and must therefore make better progress in product innovation". Indeed, the recent trend towards transferring labour-intensive operations across the border is a response to the recognition that Hong Kong is rapidly losing its competitive edge as a low-cost manufacturing centre.

The arguments in favour of a shift towards designing are compelling:

- True industrial independence is achieved only when the local industrial activity encompasses all manufacturing stages including product innovation. Mere manufacturing to the specifications of clients from overseas makes the local industries vulnerable to the fortunes of the clients. Thus, whenever the clients 'sneeze' the local industries 'catch cold'.

- Without local efforts in product design, we lose touch with the customers whose needs are expected to be served by our products. Today's customers are increasingly responding to corporate identity and image. Mere manufacturing does not develop a corporate identity; designing does.

- There is much talk these days about the need for Hong Kong to move 'up-market into more 'added-value' activities. Clearly, of all the industrial activities, designing has the greatest potential for adding value. For instance, in a 1983 survey of U.K. industries [2], it was found that design-conscious companies outperformed others in terms of the three basic business indicators - return on capital, turnover growth and capital growth. Further, although there were some commercially successful companies which did not devote much effort to product design (but pursued some other strategy such as process automation), the research concluded that successful management of design clearly enhanced the chances of business success.

- A great proportion of the technological developments presently sweeping the world manifest themselves through new products and services. Thus, when we miss out on product innovation we also miss out on all these technological developments. Without in-house designing, we may be one of the lucky survivors based on an old technology, but our existence will be tenuous, and industrial future always uncertain.

WE ARE NOT ALONE

The inability to use design effectively is by no means a concern confined to Hong Kong. For instance, there is growing realisation in U.K. that a major reason for the dramatic reduction (from 27% to 9%) of its share of world trade in the last thirty years is the 'relative neglect of the management of design/product strategy' in its industries and tertiary education. Consequently, since 1979, U.K. has taken several conscious steps to study the malaise and develop solutions [3 - 5]. Further, the Council of National Academic Awards (CNAA) published a report addressing 'Managing Design - An Initiative in Management Education [6]' addressing the 'virtual absence of the management of design from the curricula .... of higher education'. Since then, higher education in U.K. has taken several significant steps to 'foster a generation of industrial managers who are not merely unafraid of using design but have empathy with

the design process and pride in their capacity to put it to good use [7]'. It is time for Hong Kong to initiate a similar discussion on the steps needed to substitute the present culture of 'mere manufacturing' by one of 'designing and manufacturing'.

THE NATURE OF DESIGN MANAGEMENT

There is considerable variation, even amongst expert sources, in the understanding of the term 'designing [6]. Webster's dictionary says that to design is to "fashion after a plan". Some view designing in extremely abstract and general terms as "the performing of a very complicated act of faith". Others view it, in more concrete terms, as "a creative activity .... to bring into being something new and useful that has not existed previously" - a definition which makes 'designing' almost synonymous to 'invention'. The CNAA of U.K. takes a wider view in its definition of designing as "the preparation of solutions to problems concerning creating, producing and marketing products" [6].

The nature of designing, particularly in the context of manufactured products, is complex and multi-disciplinary (see Figure 1). Further a dominant current trend in manufacturing is that both engineering and consumer products are increasingly becoming 'mechatronic', i.e. they make extensive use of mechanical as well as electronic components. Thus, the performance of the 'Design for Manufacture and Against Failure' function requires mechanical and electronic engineers who are educated and experienced in the fundamental mechanical/electronic sciences and are capable of utilising modern computer-aided design and analysis systems. The performance of the 'Design for Appearance' function requires designers who are well trained in aesthetics and industrial arts. 'Design for Manufacture' requires engineers with a thorough understanding of the produceability of components and products in the context of the available manufacturing technology and the existing level of industrial automation. 'Design for Market' requires people with an understanding of the ever-changing trends in consumer behaviour and markets. Finally, the function of 'Design Management' is to 'pull together' the above four functions into a fully integrated stream of activity that meets the marketing requirements and strategic goals of the particular business enterprise.

The term 'Design Management' can be interpreted at several levels as, for example,

- the internal management of design organisations,
- the management of design projects in manufacturing organisations,
- the responsibility to match design talent with market opportunities and 'pick winners' [8],
- the process by which the innovation phase of technological change is matched to the structure and strategy of the business organisation [7], or
- the totality of awareness of the significance of the product by managers and to the techniques through which this awareness is articulated [6].

Whatever the interpretation, the purpose of design management is to harmonise technological change and the organisation and this is often done in a threefold process [6]:

- looking for those technological developments a particular organisation is best suited to exploit,
- examining the ways in which this technology can be turned into new equipment and processes, and
- initiating the changes in the organisation which are necessary to make the maximum use of the new opportunities.

INTERNATIONAL VARIATIONS IN DESIGN MANAGEMENT

While a definite concern about the role of design in international competitiveness is evident in most developed countries, there are significant variations in international attitudes and approaches to design and its management. Some of these variants [6, 9] are listed below:

WEST GERMANY:

- Product requirements are researched thoroughly.
- Significant concern for standardisation and functional aspects of design.
- Technical and market aspects tend to be emphasised over the aesthetic.
- Some say that the compensatory factor of high quality is overrated.
- Design consultants exist but are called in at too late a stage, i.e. after the constraints have already been set.

ITALY:

- Emphasis on diversity, novelty and innovation.
- Designers enjoy high status. Design is managed by designers and not by managers.
- Freelance designers favoured.
- Design patronage by companies is well established.
- Design is seen as a natural and normal part of a company's activities. Design is viewed as an 'added-value' factor and not as an unfortunate overhead to be minimised.
- Efforts are made to create an atmosphere of 'creative tension' in organisations.

USA:

- A highly pragmatic approach - 'design needs to earn its keep'.

- Emphasis on packaging design and designing in the service of corporate identity.
- Highly developed market research and product specification processes.
- Attention to detail and high standards of presentation.

JAPAN:

- Design recognised as central to corporate policy.
- Moving away from process innovation into product innovation.
- Incremental designs given higher priority over new products.
- New products supported to enhance 'corporate mission'.
- Emphasis on value analysis, ergonomic analysis and analysis of competitor's products.
- Very detailed pre-planning, clear and written statements of design policy, and design guidelines on technical/styling matters.
- Strong government support and government-industry links, eg. the Japan Industrial Designers' Association (JIDA) initiated by the Ministry of International Trade and Industry (MITI), the Japan Industrial Design Promotion Organisation (JIDPO), and the G-Mark Award Scheme.

HOW GOOD ARE WE?

While designing "may" be playing some part in Hong Kong's economic success, Hong Kong is not regarded as a centre of design excellence [6]. Generally, we 'build to customer design'. Typically, our firms assemble products using components which are either bought-in from other Far Eastern centres or, less often, manufactured in-house.

Given the above scenario, the question of our proficiency in design excellence (or otherwise) degenerates into the question of our proficiency in 'design for manufacture' (see Figure 1). In particular, since assembly is the dominant process in our manufacturing industries, we must assess, in comparison with similar products from our competitors, how good are our products in terms of 'assemblability'.

How can one objectively compare the assemblabilities of diverse sets of products when each product in each set is distinct in terms of its design features and, possibly even, functional requirements? Clearly, one needs an objective and systematic procedure to enable such a comparison. This problem has recently been addressed by the author [10] where it was shown that the 'U Mass System of Design for Assembly [11]' provides such an objective procedure for comparing the assemblabilities of diverse sets of products. (It is interesting to note that no such objective methods exist today for systematically assessing the 'manufacturability', e.g. weldability/mouldability/machinability, of a product in the context of any other manufacturing process.)

By utilising the working charts provided in the U Mass System [11], the designer can simply begin with an exploded view of his product and then systematically assess the redundancy or otherwise of each component part and, further, the cost of handling and inserting each part in the chosen mode (manual or automated) of assembly. Finally, the designer arrives at a numerical figure called the 'Design Efficiency' which represents the ratio of 'ideal' to 'actual assembly cost' (the 'ideal' assembly meeting the same functional requirements as the actual assembly).

The author has computerised the above procedure and applied it to a large number of low-cost and similar products from Hong Kong, the PRC and Japan [10]. The results showed that the Hong Kong products, while being marginally superior to comparable products from the PRC, were significantly and consistently inferior to similar Japanese products in terms of assemblability (see Figure 2). It is concluded therefore that, even in the one area of product design (i.e. assembly) where we could have excelled, our design performance has been very poor indeed.

SOME ISSUES TO CONSIDER

Consider now the steps that can be taken to develop a mature designing ethos in Hong Kong. This is not a simple task since designing is entangled with many social, commercial and technical factors. Hence, the first step is to promote an informed debate (which has so far been lacking) through professional channels such as the IIE and HKIE. The following are some of the major issues requiring immediate attention.

- Our Position in the Technological Diffusion Path:

The timing and nature of design activity in a particular organisation depends on the position the enterprise occupies in the technological diffusion path [6]. Here it is useful to distinguish between the 'motive' and 'induced' branches of new technology. 'Motive' technology refers to fundamental and mainstream developments in technology, e.g. a new generation of LSI chips or microprocessors. Such developments often require a mature R&D culture and massive R&D inputs. Since these components have traditionally been missing in Hong Kong, it is unrealistic to expect us to participate in the development of such technology in the short term. In contrast, the 'induced' technology, which refers to the utilisation of the mainstream developments in meeting the anticipated needs of customers (e.g. the application of a new microprocessor in a new product), does not necessarily need massive R&D inputs. It is therefore believed that Hong Kong is well-poised to

participate with greater vigour in the diffusion of 'induced' technology.

- Implications of Small Industries:

The available international evidence suggests that, whereas in capital-intensive industries (such as aerospace, motor vehicles, dyes, pharmaceuticals, metals, etc.) innovations have been monopolised by large firms, there are many areas (such as instruments, electronics, textiles, machinery, paper and board, etc.) where entry costs are low and small firms (those with less than 200 employees) have demonstrated a significant number of innovations [12]. Since these are the exact areas in which we have had considerable experience, there is no fundamental reasons for our small industries to despair. Informed studies on the entry costs into these areas in the Hong Kong context would therefore be particularly useful.

- What Are the Cultural, Social and Political Obstacles to Our Enterpreneurs Taking a Long-Term View?:

A shift towards 'design and manufacture' from 'manufacture to customer's design' does indeed increase the risk and uncertainty in business. Historical trends show that the design pay-back periods range from 3 years for scientific instruments to 7 years for chemicals [12]. Are there any real or perceived obstacles to our enterpreneurs taking such a long-term view of their business? In particular, we may examine the implications of the local domination of family ownership, the spill-over of our industrial activity across the border, the volatility of our capital markets, the principles of 'laissez-faire' being so scrupulously followed by our Government and our transition into a new era in 1997.

How Can the Government Help?:

Since a shift towards design is entangled with cultural, social and political factors, the Government has a special role to play in

- developing design awareness in the society,
- organising public support to industrial design through subvented bodies similar to JIDPO etc. adopted in Japan,
- promoting international recognition of our products through Quality Standards and other Award Schemes, and
- strengthening design management education in our tertiary institutions.

EDUCATION FOR DESIGN MANAGEMENT

Our tertiary institutes presently offer an array of courses, each covering a specific component of the design process (see Figure 1). For instance, we have distinct engineering courses covering mechanical or electronic knowledge needed in 'design for function and against failure'. We have a department (at the Hong Kong Polytechnic) devoted to the dissemination of knowledge concerning 'design for appearance'. 'Marketing' in the commercial context, although not in the context of 'design for market', is covered in our management courses. Our manufacturing engineering courses now inlcude substantial components of 'design for manufacture'.

The above array of courses, however, suffers from the following drawbacks:

- they are too specialised.
- they do not meet the special needs of modern mechatronic products.
- they do not systematically develop skills in product and design management and, hence, do not provide a total view of 'designing'.
- the management courses are all commercially oriented and, hence, lack empathy with the technical processes contributing to design. Further, 'marketing' concepts are not fully extended into the design sphere.

Clearly we now need to develop a new generation of courses capable of supporting the shift towards design that seems to be imperative , if not imminent, in Hong Kong industry. Two types of courses, in particular, seem to be appropriate:

- undergraduate degree-level courses covering the essentials of all the four design processes in the context of mechatronic products and competence in 'Design Management' (see Figure 1).
- post-graduate management courses for specialist engineering graduates (i.e. courses on Engineering Management) with appropriate emphasis on 'Design Management'.

CONCLUSION

In order to maintain its international competitiveness, Hong Kong industries need a shift towards 'designing and manufacturing' from the present ethos of 'manufacturing to customer's design'. This shift is entangled with several cultural, social and political issues. A general awareness of these issues can be promoted through an informed debate orchestrated by local professional institutions such as IIE and HKIE. Further, there is a need to develop a new generation of courses directed towards 'Design Management' in our tertiary institutions in order to support the shift towards designing in our industries.

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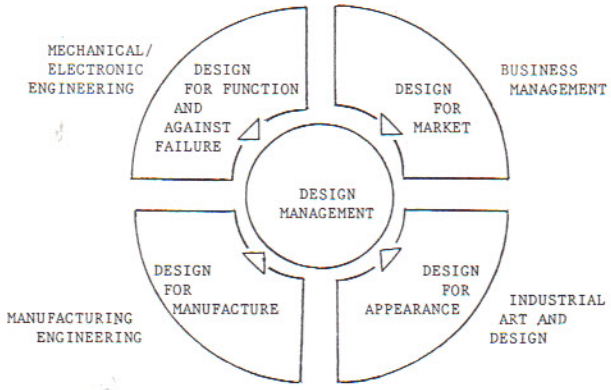

Figure 1 The Interdisciplinary Nature of Design and the Role of Design Management

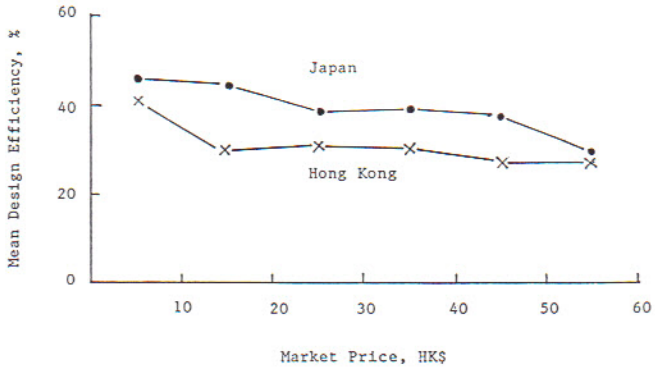

Figure 2 How Hong Kong Compares with Japan in Design for Assembly

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Dr. Patri has had over twenty years teaching and research experience. He is a Corresponding Member of the International Institution for Production Research (CIRP). Over the last twenty years he has served in various teaching posts in India and at the Hong Kong Polytechnic. While at Hong Kong Polytechnic, he took a leading role in the development of the B.Eng Course in Manufacturing Engineering and the development of CAD/CAM.

In 1987, Dr. Patri joined the City Polytechnic of Hong Kong as the first Head of the Department of Manufacturing Engineering. The Department is presently developing Higher Diploma and Degree courses in Manufacturing Engineering and a Post Graduate Diploma course in Engineering Management. Dr. Patri's current research interests include machining science, CAD/CAM and Design for Assembly.