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# Balance in Research and Practice: the Reform of Research Studies in Industrial and Product Design

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There is not a long history of research studies in Industrial and Product Design (IPD) in China. In this article, the author initially reviews the current research studies in IPD in China. He identifies the limitations and deficiencies of these research studies, which either emphasise engineering or fine-art aspects. Most of these research studies are thesis-oriented, with research students only focusing their efforts on the writing of theses. The studies lack any practical experience in research areas. Taking Hong Kong design research programmes as a case study, the author criticises this kind of thesis-oriented research studies in IPD, since it de-motivates students from putting an effort into the practice of their research areas. The author then attempts to identify the changes necessary in research studies in IPD. By using the reform of research studies in IPD in Hong Kong as a case study, the author discusses the advantages, limitations, difficulties and possibilities of having a balance in research and practice in research studies in IPD.

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## INTRODUCTION

Although there is not a long history of formal research studies in engineering, as well as other science and technology disciplines in the universities of China compared to other countries, the talents of research students and research output potentials in China have attracted the attention of the world in recent years. For example, the cover article of a recent issue of *Time* magazine (30 October 2006) clearly identified that the engineering, science and technological design research in Asia, including China's higher academic institutions, have the potential to reach the levels acquired for decades by Europe and the USA, so much so that Western countries are required to *watch out* [1].

However, when the research outputs and achievements of research students in China (including Hong Kong, a Special Administrative Region of the Mainland) are reviewed, it is not difficult to see that most of the successful research studies and programmes in engineering, as well as the science and technological design areas, are still carried out in a conventional manner [2]. Most research students are good in engineering and scientific theoretical analysis (including complicated mathematics calculation), but

lack creativity and innovation in their research outputs [3]. On the other hand, many research students lack practical experience in their research areas, since most of the time, their analytical outcomes and recommendations are commented on as being *too theoretical* and *impractical* by the product engineering and design industries.

The curriculum planners in China have started to realise these limitations and shortcomings in conventional engineering curricula and practices. In order to promote creativity and innovation in product engineering and design, Industrial and Product Design (IPD) has become a popular discipline/subject recently. One reason for this is that IPD curricula have claimed to have more focus on nurturing students' creative thinking and problem solving in order to meet the current rapidly changing needs of industry, especially the product engineering and design industries. Therefore, besides organising independent IPD programmes, more engineering departments have started to collaborate with art and design departments to co-organise IPD programmes.

For the past two decades, most of the IPD programmes have been at the undergraduate level. The outcomes of the programmes have been quite successful because most of the graduates of these

programmes are able to take more initiative and be more creative in product innovation and development. Studies have also indicated that quite a lot of employers have good comments on the performance of most graduates of IPD [4].

Since the late 1990s, some universities have started to include IPD areas (or research topics) in their research programmes. Take the Tsinghua University in Beijing as an example; apart from its highly regarded engineering research programmes, its design academy has started to offer research programmes in the area of IPD. In Hong Kong, as one of the leading design schools in Asia, the School of Design at Hong Kong Polytechnic University has started to offer IPD research studies much earlier in the mid-1990s. Since the school can boast having the first group of research graduates in the IPD area in the entire region of China, it is no surprise then that most of these graduates are now leading people in the IPD industry, as well as in design institutions.

While still a topic needing more comprehensive investigation on whether this kind of research study (in IPD) is better able to nurture creativity and innovation skills in students than conventional engineering and design research programmes, it is a fact that research studies in IPD have brought new directions and opportunities for the development of engineering, design and related programmes. Yet while reviewing these research programmes in detail, it is not difficult to realise that they still have quite a few limitations and deficiencies that require attention.

One of the key limitations and deficiencies is that many of these research studies in IPD still follow the mode of conventional research studies. Students are too focused on theoretical research (exploration and analysis) and thesis preparation. In other words, these research students have very little practical experience in their research areas. Their studies, as well as their study outcomes, are criticised for being too *shallow* or *superficial*. Furthermore, what they have studied or researched can be likened to the Chinese saying: *Making a car inside a room*. For example, in studying street furniture in Hong Kong, research students like to undertake certain methods, such as tracing the development of street furniture in the city, reviewing government documents, studying theories from one particular perspective or different perspectives, and then making theoretical arguments in their theses. However, these students do not gain any practical experience in street furniture design related to their areas or scopes of studies. This method of conducting studies may maintain good theoretical research of the topic, but the major potential drawback is that students easily neglect how to justify (or

falsify) arguments from a practical or empirical perspective. People criticise this kind of institution-based studies as lacking practical verification and validation.

In fact, the nature of IPD, as well as its study, should not be like this, since the practical application of theoretical research of the subject should be one of the key contents and goals. Then how can research studies in IPD have a breakthrough in this regard? How can research studies in IPD show a balance between research and practice?

## REVIEWS OF CURRENT IPD RESEARCH STUDIES

Since the late 1990s, several reviews of IPD research studies have been conducted. The scope of these reviews has focused on IPD research programmes/studies offered in China, including those in Hong Kong. The key objective of the reviews has been to explore the strengths and limitations of the research studies in IPD.

The qualitative approach has been adopted for the reviews in order to have a more in-depth understanding on the topic and, in turn, to establish a way of research studies in IPD that can face the continuous changes of society, such as social, cultural, economical and industrial changes [5]. The main methods include the following:

- Reviews of policies and programme documents;
- Interviews with university professors (supervisors of research studies) and research students;
- Reviews of the structures of studies and natures;
- Formats of students' theses (research outputs);
- Interviews with people working in the product engineering and design industry.

## Two Major Directions of Research Studies

Interval analyses of the reviews were conducted in 2001, 2003 and 2005; there is also a plan to continue the research in 2007 and subsequent years. The up-to-date key findings of the reviews show that there have been two major directions of the existing research studies in IPD, namely:

- Engineering-oriented;
- Fine-art-oriented.

Additionally, there has not been any significant reform in the research studies in IPD. In fact, discussions on the reform internally in some design institutions, as well as inter-institutional seminars and

meetings, have been conducted for the past few years, but there has not been any critical breakthrough and implementation of the necessary reform.

The former direction mentioned above requires research students to engage in in-depth study of a particular engineering or technological topic. The findings indicate that there is no significant difference between this direction of study and a conventional engineering research study. Most of the time, students need to follow in the tracks of their supervisors and focus on particular topics, such as material technology, mechanics, interactive information systems, ergonomics, etc. Many research students hide themselves inside laboratories or workshops to carry out *research*, with most of the topics or titles assigned by their supervisors. One of the major drawbacks of this kind of research is that quite a lot of students do not clearly understand the meanings and practical objectives of their studies. After a period of time of research (the duration of a research study), students are then required to compile their findings and submit their theses.

On the other hand, the latter direction of research study requires research students to focus more on fine art, traditional, humanistic, social and cultural elements. It has also been one of the major trends of research study in IPD on the Chinese mainland since this area of study was developed in the early 1990s. Most of the time, instead of calling this type of research study *a new direction* in design studies at the postgraduate level, it is better to see that there is no significant difference between conventional research study in fine art and this new development. As some interviewed programme planners and coordinators agreed, sometimes what the new things to research studies in IPD compared to conventional research studies in fine art are only the polished titles of the new programmes or the re-written objectives in the programme document.

Compared to undergraduate programmes, research studies in general have a higher flexibility (or looser quality assurance) on the processes and outcomes. This situation makes the quality assurance of the research programmes more *flexible* – or sometimes without any control. Moreover, if the research studies are only from the artistic, humanistic and/or cultural perspectives, students put most of their attention on the historical studies and theoretical analyses. The major contents of their theses are also on the theoretical arguments of different theories and their potential applications in real situations. However, the critical drawback of these kinds of theses (research outcomes) is that the proposed *potential* applications do not have any practical and objective validation or verification. That is, students lack practical experience in the

subject area to justify the research outcomes. The potential applications of research are always just personal interpretations on some theories based on the support of other theories.

### Unattractive and Insignificant Research Outcomes

It is not difficult to realise that these research outcomes listed in the theses are often unattractive to practical professionals. This is because the theses give little practical implication or suggestion to bring IPD to have further and better developments. Interviewees, including some supervisors of IPD research students, complained that hundreds of these types of theses are placed (or hidden) on the shelves of university libraries, where few people would have the chance or be interested in reading them. Most of the time, the borrowers of these research outcomes are other groups of research students.

Furthermore, rarely are publishers willing to publish these research outcomes since they lack practical evidence and examples. Therefore, most of these outcomes cannot attract the interest of general readers. As also agreed by the people working in the industry, these research outcomes are unable to bring significant breakthroughs in the subject matter.

If the breakthroughs in IPD theories and practices in recent years are reviewed, one would find that most of the practical and commonly recognised breakthroughs have not come from the results of research studies, but from universities' other applied research and consultancy projects and industries' professional practices. The core common ground for these breakthroughs is based on practical working experiences and empirical experiments in applied research.

### MAJOR CAUSES OF THE LIMITATIONS AND DEFICIENCIES

According to the findings of the reviews, there are several major causes for the current limitations and deficiencies of research studies in IPD. These are detailed below.

#### Policy and Planning

Most universities do not have any well-planned policies and directions in the development and implementation of research studies in IPD. For the past two decades, the only thing that has changed is the more attractive title of the studies: *design*. As agreed by some programme coordinators of IPD programmes, there was consensus on changing the

research programme title by replacing the word *engineering* with *design*. Under the banner of *design*, people easily have the illusion that the programmes – research studies – are creative and innovative-oriented. The new programme title also gives people the impression that research studies in IPD are new and more practical with industrial and product design elements.

### Control

As stated above, research studies in general have a relatively more flexible (or looser) space compared to undergraduate programmes for administrative staff and supervisors, as well as students, who do *what they want*. Such situations easily create a drawback in the progress of changes in programme structure, making change much slower and the quality assurance of the study outcomes less controlled. For example, even if the directions or objectives of an IPD research programme are well-planned and written, whether or not the implementation of the programme matches with the directions and objectives is another question. As agreed upon by some interviewed experienced supervisors in research studies in IPD, there is in fact little change in the contents and research activities in the programmes.

### Programme Structures and Assessment Requirements

Rigid programme structures and assessment requirements of research studies is the key cause of the limitations and deficiencies of research studies in IPD. According to the review findings, there are few changes in the programme structures and requirements of research studies over the past few decades. Although there have been some education reforms, the situation has not seen any significant changes.

The current general structure of research studies in China does not encourage (nor give positive support to) students to participate in practical (or applied research) projects. Students are required to meet the rigid deadlines of substantial amounts of paperwork (such as proposals, interim reviews and final theses). Additionally, the *quantity* of these works under the current system is quite heavy. To play it safe within the structure of these deadlines and the requirements of paperwork, applied research is, most of the time, not a wise direction. Most students prefer to put their effort in *writing* instead of having more real exploration and practice. For example, if a student's research topic is about bus stop design, then most of the time, the student would only participate in

a review of existing bus stops and perhaps write some comparative studies on designs in different places. However, it is rare for a student to participate in applied research projects related to bus stops. Obviously, there is no significant harm for this kind of current research practice since it can still generate more understanding on the topic from a theoretical perspective. Also, applied research or practical project experience may not be better than theoretical research. Yet as stated above, under such biased methods of research studies on a subject, IPD, which claims to be a practical and applied subject, current research students lack *real* practical experience in the area, or else gain very little from their hands-on experience. This is also the reason that their studies and research outcomes are viewed as impractical, inapplicable and sometimes unrealistic [6][7].

In addition to the programme structure, the assessment requirement is another factor significantly affecting the quality of research studies in IPD. Taking Hong Kong as an example, the programme structure of research studies has not made any significant change since the 1950s. Up to the present moment, the assessment method for research studies are still based on the conventional policy and practice of the British education system; that is, the major critical research outputs for assessment are still students' theses. Although this situation has slightly changed so that the process of research studies has been considered more by the educators over the past decade, the thesis is still the only element for assessment by internal and external examiners.

Additionally, the focus of assessment is often on the theoretical analysis instead of significant weighting on the practical *experience* and *applied research result* of particular research areas. As reflected by the comments from interviewed students, such an assessment nature and focus de-motivate students to put effort and time on the practical experience in their research areas. Students all know about the rules of the *game*. As pointed out by students, they preferred to spend more time on the preparation of their thesis, such as quoting more references, instead of providing more practical, successful – or sometimes even unsuccessful – results.

### Administrative Staff

One of the indirect causes for the limitations and deficiencies of the current research studies in IPD is the limited knowledge and experience of curriculum planners and coordinators. It cannot be denied that administrative staff plan and make decisions on the curricula based on their own experiences. Yet, as stated

at the beginning of this section, most of the curriculum planners and coordinators lack the experience to plan and execute research curricula in IPD. As a result, they consider research studies in all subject areas as nearly the same, with the only difference being the subject contents and research titles.

Moreover, changing the structures and assessment requirements of research studies needs a great deal of effort, as well as courage. This is also lacking in current university education. Therefore, the only so-called changes in recent years are the titles of some programmes and objectives printed in programme documents. However, there is little change in the actual implementation of research studies. This is also why there have been no significant changes in research study requirements and the format of assessments in research studies, not only in IPD, but also most of the research study subjects, for the past 50 years.

### Supervisors

The background and experience of supervisors and their unwillingness to make changes are another cause of the limitations and deficiencies of research studies in IPD. It is a fact that many research supervisors, particularly in China, received their research education (with some not receiving any) a long time ago. Most of their research studies were also under conventional research practice. Thus, quite a lot of them lack knowledge and experience regarding new trends, directions and the needs of research studies in IPD. The situation is further exacerbated by many supervisors not having any experience in guiding students in the subject. Thus, many of these supervisors tend to use those research methodologies that they are familiar with or have used before to supervise their students. That is, what the current batch of supervisors expects their research students to know and do is similar to what their supervisors expected.

Moreover, it is quite interesting – but very true – that many of the interviewed supervisors complained about the new practice of research studies in IPD that such practice results in students could not have a better theoretical understanding as for previous research students. For example, some supervisors cited that the art and cultural fundamental knowledge of today's design students was so bad that they would not meet the standards of undergraduate level 20 years ago. Although it may be a fact that students' fundamental knowledge in some areas is not as good as previous generations', it is also a fact that the objectives of research studies in IPD have changed significantly in reference to conventional research subjects. Relying on the *old* sometimes may result in

a road block to reform in education [8-11].

On the other hand, even though there are some young supervisors, such as those coming back from foreign countries, who have gained new research experience and are willing to make changes, their junior position in the universities hinders them from making any critical reform in research programmes, especially the supervision of research students, which is the territory always occupied by senior faculty.

### Students

Students themselves are also the cause of some limitations and deficiencies in the current research studies in IPD. Similar to the problems of their supervisors, many research students do not have any background knowledge and experience in relation to the new needs and trends of research studies in IPD. Thus, all they can do is follow (but not question) what their supervisors did or what their supervisors tell them to do [12]. Many students also like to look at what their senior colleagues are doing and then conduct their research in the same way.

On the other hand, as mentioned above, the assessment method of research studies dominate and lead the practice of research studies. Under the current thesis-oriented assessment requirements and the serious negligence of practical experience (or applied research experience) in research areas, students like to play it safe and put less effort on practice. Take, for example, a student working in the participatory design in streetscape and street furniture, who disappointingly pointed out that he had made a wrong decision in putting effort into participating in the *real* (he emphasised the word *real* instead of the word *applied*) participatory design work on a street. He stayed in the street for more than five years for his PhD studies. However, he was still unable to finalise the key findings for his study despite the fact that his supervisor continuously pushed him to be quick in submitting his thesis. The student's supervisor agreed that, in order to graduate, the student's practice project experience was important but not more important than a more comprehensive thesis meeting the expectation of the examiners who would base their decision on the conventional weighting of research studies at the university. Furthermore, the student complained that some of his fellow colleagues had already gained their graduate degrees while they just stayed in their studios to conduct their literature research and present their theoretical discussions in their theses.

Although this example may not totally reflect, or be applicable to, the current situation, problems and difficulties of research studies in IPD, it is a fact that

students will not like to have investigation (data collection) through applied research work or practice work if the current assessment systems have not changed to value the contributions, experience and results of practice.

### External Connections

Lacking opportunities to provide practice to research students is another cause of the limitations and deficiencies of the research studies in IPD. It is a fact that practice more or less means connections with the industry, sectors or opportunities outside universities [13]. However, as discussed above, many university supervisors lack experience in practice outside the universities. This situation creates difficulties and sometimes embarrassment to the supervisors to search and ask for practice opportunities from outside. Thus, supervisors either would prefer to require their students to focus their research on something that is more easily controlled and available inside the universities, or require the students to search for opportunities for practice by themselves. As reflected by some interviewed research students, they sometimes knew the importance of practice. However, similar to their supervisors, students prefer not to spend *a lot of* effort to search for opportunities for practice.

Moreover, although industries in China have recently preferred to have collaborations with universities, most of the time, these collaborations are only on consultancy-related projects. In China, the situation is that this is still not a trend when compared to Western countries where students find it relatively easier to find opportunities to gain practical experience in their research areas. This is also the major reason why supervisors and research students give up and then undertake their research inside universities.

### CHANGE IS NECESSARY

According to the findings of the reviews, several areas regarding the current research studies in IPD are necessary to change (that is reform). These areas can be summed up as a question of the *balance* in two major aspects, specifically:

- Directions;
- Ways that studies can fit these directions.

#### Balance in Directions

##### *Academic Autonomy/Society*

When talking about *practice*, *applied research* or

*practical experience*, many people would associate them to have a closer relation (and dependence) with sectors outside universities. In turn, some people may be afraid of the loss of academic autonomy, while others may worry that research studies will easily be led by external sectors that are associated with resources and funding, in particular interests for profit making [14][15]. It cannot be denied that such situations may exist, but most of the time, the actual situation is that the negative side is over-exaggerated [16]. The real situation nowadays in that research studies in IPD in China is exactly the latter situation, that research studies lack connection and contact with the outside world, including industry. Students, as well as their supervisors, are often too out of control (that is, lacking a balanced direction) to undertake what they want; in turn, the processes and outcomes of research studies are criticised as being *too autonomous*.

It is obviously true that research studies should have academic autonomy and cannot only be led by external factors, such as industrial and economic factors. On the other hand, more researchers in different disciplines have identified that it is also essential for research studies to consider the needs of society [17-19].

Research studies should not be considered as the utopia inside universities and neglect what happens in the outside world. Instead, universities (particularly research activities inside universities) are expected to have a kind of vision and mission to give contributions – directions, advice, reminders – to society on how to keep going further. In this way, one of the important programme characteristics of research studies in IPD is to keep on changing – educational updates and improvements – to match with, or to give, positive influence on, and contribution to, the continuous changes of society, such as social, cultural, economic and industrial changes [20][21].

##### *International Perspectives/Local Issues*

Directions of research studies in IPD need to have a balanced consideration regarding international and local matters. However, it is also a common deficiency of current research programmes. Take, for example, in 2000 when one of the external members of the Department Assessment of the School of Design at Hong Kong Polytechnic University criticised the research topics of current research graduates and students. On the one hand, the titles did not have a wide perspective to explore the development of the outside world. On the other hand, the topics did not address local issues that students' research

experiences and outcomes could not serve (or at least be concerned with) local needs.

According to the reviews on the research topics of some universities on the Chinese mainland that offer research studies in IPD, such problems have also existed. On the one hand, there is little consideration for the views from different perspectives of the outside world. On the other hand, research cannot bring concrete benefits to local or regional societies.

### ***Global Trends/Particular Characteristics***

The directions of research studies in different places (universities) need to have their particular characteristics. It is easy to see that many of the current research programmes claim to meet global trends, as well as related research directions and areas. Consequently, some popular (or fashionable) research topics, methods of study and outcomes have been intensively coming out nearly at the same time recently. For example, lifestyle has been a red-hot topic since the early 2000s. For instance, a large number of IPD, as well as other engineering and design research topics in China, are directly or indirectly related to this topic. Titles with the word *lifestyle* are also very common today. Actually, there is no significant harm from this kind of situation. More investigations and discussions on a particular topic can promote and accelerate awareness, discussion and understanding.

However, the critical argument here is that many of these red-hot research directions, areas and topics are too speculative in nature. Furthermore, some other topics are easily omitted. Research studies in IPD in different regions have begun losing their particular visions, missions and objectives according to local needs, as well as universities' and students' particular strengths, interests and potentials for development.

Moreover, different countries, as well as universities, must have their own backgrounds, strengths and characteristics in academic research. It is also what some well-known Western countries and universities treasure. For example, some countries may have good practice and experience in social movement or research, while some universities may be strong in scientific invention. However, many of the current IPD programmes in universities in China, as well as many developing Asian countries, follow or only copy the trends of foreign universities. This kind of practice will easily lose the particular characteristics and strengths of a particular region or university, while at the same time finding it difficult to undertake activities or things as others do.

### ***Theoretical Exploration/Practical Experience***

As discussed above, research studies in IPD today are mostly biased towards theoretical aspects, while some of them are too technical and skill oriented.

In fact, it is appropriate and should be encouraged to have more theoretical research at the research study level as such research can generate more discussions and understanding of theories. However, according to the reviews of some of the selected theses of IPD produced recently in China, the critical problem in theory contribution in IPD is that most of the theoretical exploration and analysis is only based on the reinterpretation and further analysis of some existing theories. Students' first-person practical experience in the verification and exploration of theories is limited. In this way, most of the time, theoretical analysis would easily become just a *game of words* and *subjective re-judgement and re-interpretation on existing theories*.

### ***Balance in the Ways of Studies***

A reform of research studies in IPD has been implemented in Hong Kong since the early 2000s. A case study on the progress and effectiveness of the reform has been conducted in parallel with the implementation of the reform. As the reform is still being piloted, not all of the research students in the design school are participating in the new programmes. Instead, only some new IPD research students (including some research students from the Chinese mainland co-supervised by supervisors in Hong Kong) enrolled in the research programme after 2000 have been involved in the new practice of the research studies. This pilot run is expected to generate experience and insight for a more comprehensive implementation of the reform in Hong Kong, as well as other regions in China.

The reform has focused on how to obtain a more balanced direction in research studies in IPD. That is, students need to maintain a good level of quality in theoretical research while they also need to participate in projects that are related to their research areas. Most of the time, supervisors will arrange projects for students. Students may also have contact with external parties to seek project opportunities by themselves.

In detail, first, the reform has tried to strike a balance in academic autonomy and interaction with society. General practice supervisors and students need to keep in mind that students' research directions, topics and interests cannot only be led by the interests of *outsiders*, especially those who may have the

possibility of giving financial or other kinds of resource support. More or less, research studies in academic institutions – universities – are required to be visibly committed to giving some *honest* directional suggestions and comments to society. It cannot be denied that the world outside universities, especially industry, is relatively more short-sighted and easily focused on profits. Research studies cannot act merely as a tool for others' particular interests [14].

On the other hand, as indicated above, students' research cannot be isolated from society. Interaction with society entails good communication and contributions to society. This further means that research students need to have good dialogue with society, for example, government sectors, NGOs, industries, the public, particular interest groups, etc. In order to meet this objective, the findings of the review on the reform show that the best way is to have practical participation in *real* projects, such as a student's research title being related to street furniture designs. In this case, what the student was required to do was to work with government departments and participate in the research and design projects in urban areas. He participated in the meetings, field research and development of design ideas, and, in turn, generated empirical findings and experience for his theoretical arguments.

The reform expects research students to have not only international perspective, but also consider local matters. The reviews of the reform show that this method of balance is not so difficult for Hong Kong students to obtain. Many research students have already gained a lot of exposure to other countries during their undergraduate studies. The advancement in technology also allows students to widen their view and access resources relatively easier than before. Increasing resources provided by the university also permits students to have more opportunities for exchange and engage in visits to other places. For example, in 2006, each research student in the university can have about US\$2,500 associate money for him/her to spend on exchange and visit purposes.

The interviewed supervisors agreed that more students have also started to realise the importance of their studies on local matters. In fact, according to observations, some students might go into another very extreme direction whereby they too keenly and narrow-mindedly focused their research work on local matters, but neglected a wider perspective (for example, global issues) in their research studies in IPD.

Moreover, as indicated by the supervisors, whether students could transfer their international knowledge and experience into their studies and apply them to

local matters is another question. It is a fact that there is still no well-organised plan or system to help students to do it in many research programmes, including those in Hong Kong. It can also be said that most of the time, supervisors' advice on this matter is quite piecemeal. Therefore, providing well-organised and regular help on the matter is urgent and essential.

Another balance that is needed in research studies in IPD is in the global trends and particular characteristics. According to observations, most research students were sensitive to global trends. As discussed above, this provides advantages from current technology advancements and increased opportunities from exposure. However, this kind of sensitivity also has a drawback in that research students easily neglect the importance of certain local characteristics, including those particular characteristics (that is, background, strengths, etc) of the university. For example, some students observed that it was a global trend to undertake research on transport design. However, in as small a city as Hong Kong, and without research experience, reference and industry or additional support in this particular area, it was really difficult for a research student to conduct research on this direction – at least at the current moment.

In fact, the success of Japan and Korea in IPD research in recent years is because researchers, as well as research students, have been able to grasp global trends and also utilise their particular strengths to develop their ideas based on their particular needs and characteristics. For example, the successful development of transport designs in Japan and Korea is not only derived from the knowledge of Western advancements in transport engineering and technologies, but also the capability to consider and handle humanistic, social, cultural and environmental considerations of particular regions.

Obviously, this does not imply that research studies of IPD must be bound by original and local characteristics. Taking transport design as an example again, it does not mean that Hong Kong or other developing countries without such research backgrounds or experience are unsuitable to carry out research in this area. The critical argument here is how to generate and maintain a balance between the benefits of a new global trend and the possibility of local implementation with sufficient resources and interest.

Therefore, in order to have a balance in global trends and particular characteristics, reform should, on the one hand, allow research students to gain greater exposure to the outside world. On the other hand (and more importantly), research students should be provided chances so that they know how to explore,



understand, respect and appreciate local matters, such as histories, traditions, cultures, identities, lifestyles, geographical characteristics, individual people's needs and preferences, strengths of local academic institutions and industry, etc.

The last balance in theoretical exploration and practical experience discussed above is also the most difficult one of all for consideration and implementation. One of the major reasons for this is that there is no golden rule on the weighting of these two aspects. This is because whether theoretical exploration or the practical experience necessary for greater emphasis totally depends on the objectives and nature of different research study topics and titles. To take it as a more extreme case, there is no problem for pure theoretical research in IPD. On the contrary, there is also no problem for pure applied research based totally on practical experience.

Nevertheless, according to the reviews mentioned above, the current situation is that most of the time, research students lack practical experience in their research areas. Therefore, the reform has emphasised encouraging and facilitating students to acquire more experience in practice, such as applied research. Taking a student researching the street multi-function poles as an example, he was encouraged and arranged to work with the Urban Renewal Authority and the Highways Department in Hong Kong, and participate in some of the projects. Officers from these departments were also invited as voluntary external advisors for the student's research. This kind of arrangement gave the student a good chance to practice what he had studied in theory and to collect practical data and experience in his research analysis. Different from before, the student not only reported to his supervisor about his theoretical studies, but also about the progress of the projects. The most important point is that the student needed to explore and take action in order to find out how to link both the theories and practical findings, as well as his experience, together.

## KEY INSPIRATIONS AND EXPERIENCE

According to the review of the reform, some key inspirations and experience have been generated. They include advantages, limitations and difficulties, plus possibilities regarding a balance in research and practice in the research studies in IPD. These are elaborated on below.

### Advantages

The advantages are as follows:

- Research findings and outcomes are emphasised not only in theoretical exploration and analysis (research), but also in design exploration and participation (practice). Furthermore, research is considered in a broader sense so that applied research findings and experience are also taken into account as an important element and requirement;
- One of the key subject natures and characteristics of IPD is for it to achieve balance in theory and practice. Therefore, research studies with this balance fit exactly the nature and characteristics of the subject;
- Relatively clearer directions, scopes and objectives of research studies can be defined; in turn, a better quality assurance on research programmes will be more effective to maintain;
- More convincing research outcomes can be generated that the outcomes have been verified through both theoretical analysis and practice experiments and/or exploration;
- Research students are able to gain more practical experience in design practice. This kind of experience further widens students' viewpoints and provides them with more opportunities to make decisions on whether they would continue to work in academic institutions or outside in industry upon completing their studies;
- Research students, as well as supervisors and universities, can realise better interactions (that is, connections, communications and cooperation) with the outside world. It also promotes the work of universities;
- Some external resources may be captured. According to the review of the reform, most of the time, the external collaboration sectors (for example, government departments and industry) will provide different natures and degrees of support for the practice of students. In fact, having the opportunity to participate in a real project is also a kind of resource and advantage for universities and students [3];
- Research students are motivated and indirectly required to consider the different issues and needs of society, particularly local matters since most of the time, practical projects are sought in local society;
- Research studies provide a good and prompt response to changes in society. This closer relationship improves the current situation because many of the existing fine-art oriented IPD studies are criticised as overly emphasising the historical topics, but seldom contemporary topics;
- Students can place greater emphasis on local

characteristics and practical aspects. This provides improvement on the current situation where research studies are regarded as being impractical work inside *ivory towers*;

- According to the review of the theses in conventional research study practices, the conclusion in terms of comments and suggestions is always the weakest part of a thesis. Having the needs and experiences gained in practice, students are motivated and indirectly required to think about the *values* of their studies. This situation can bring about another advantage in that students are required to think seriously and concretely about the comments and suggestions based on their studies regarding both the theoretical analysis and practical experience.

### Limitations and Difficulties

The limitations and difficulties that can be encountered include the following:

- The importance and value of practice may sometimes be over emphasised. The review of the reform indicates that, once a practical project has been established for a research student, the student would easily be *attracted* to put too much effort on the practical (design) project and spend relatively less time on the theoretical analysis. One of the major reasons for this is that students gain greater satisfaction more easily from practical work instead of the tedious and – at times – quite boring theoretical research;
  - On the contrary, to the disadvantage of conventional research studies that place too much emphasis on theoretical research, there may be overemphasis on the practical side if projects are set up for students. It is also one of the negative comments on the current research studies in engineering and technology subjects in North America, where students are good in practical project findings and experience, but lack a serious contribution in theoretical exploration and analysis;
  - Although IPD places emphasis on application, too much priority on the practical element in research studies would easily have a contrary result whereby research studies become a type of practical courses that only drill students' practical skills in particular areas;
  - The choice of projects is quite limited and full of constraints. For example, many practical projects are full of limitations, as well as being quite narrow in some particular aspects and areas.
- Research students sometimes need to compromise (without any choice) to participate in projects that may not fit or give advantages to their original research studies. The research visions and missions of students will also be easily influenced; that is, blocked or limited. Moreover, some areas in IPD are not easy to arrange practical opportunities for students. As such, students are sometimes required unwillingly to tune their project directions, topics, scopes, focuses or objectives due to these project constraints. All of these limitations and constraints, in turn, would affect the flexibility and quality of research, and indirectly affect the autonomy of the research;
- It is easy to have a drawback and poor assessment practice that the quality of research studies are too emphasised on the practical final outcomes, for example, practical performance of students, final design products, etc. The interviewed supervisors agreed that assessments are easily influenced by the practical outputs and external comments from the project collaborators, not merely on the analysis but on the success and experience of the practice as well;
  - The duration of studies is easily out of control since more factors are required to be considered in practical projects. For example, due to government policies and urgent matters of some departments, the progress of a research student working on a street furniture project was delayed for more than one year. Although it can be said that the student could quit the project at some stages, the fact is that most of the time, once a project starts and the direction of research on the project has been fixed, it is difficult to make any critical changes;
  - Better interaction with the outside world also implies a tight cohesion with the outside world and, in turn, such cohesion may hinder and influence the autonomy or quality of research studies, especially when related to resource considerations;
  - Greater contribution and participation in particular projects can also generate drawbacks since research students themselves become subjective in some of their analyses. This situation is similar to the critical limitation of participant observation in social studies whereby, after a long period of time involved in, or having contact with, particular research subjects, researchers will easily become biased in some areas due to the influence of the research subjects. The worst case is when this kind of bias or subjectivity is due to the conflict of interest or benefit of the resource;

- Most of the practices in practical projects are *contemporary* in time and nature. This situation may limit the variety of directions, scopes and objectives of academic research. It is also one of the reasons that historical research on engineering, technology and design research has been quite limited in recent years. However, it cannot be denied that such kinds of historical studies have their own value and significance [22-25];
- A balance in research and practice always bring contrary results regarding the difficulty to achieve balance in some other elements, such as time management, resource management, assessment weighting, etc. The increased effort in these elements is also one of the reasons that can de-motivate programme coordinators and supervisors to arrange or permit students to take up practical work in the research areas.

### Possibilities

The possibilities are as follows:

- More people have started to realise the importance of balance in research and practice. Balance provides a greater possibility for universities to arrange applied research, as well as practical experience for research students. For example, since the late 1990s, more factories, design firms and government departments in Hong Kong have been willing to undertake collaborations with local universities. Such collaborations are not bound by the type of consultancy projects carried out by professors or university senior researchers, but have also included students' research projects. This situation was rare before the mid-1990s in Hong Kong in the IPD area since students were deemed impractical and their contribution to projects unconstructive [3];
- In recent years, a more open company culture has encouraged more private sector and government departments to open their internal affairs (and projects), and allow external persons to participate more in their project work;
- Better and more numerous connections and relationships between universities and outside sectors have been established. In particular, the private sector expects to realise more collaboration with universities. For the whole of greater China nowadays, the *university* has, most of the time, become an important indicator in research quality. This situation attracts the private sector to allow research students to participate in some of their projects. Although the private sector may,

at times, not have full confidence in students, the private sector have a kind of belief that the students' supervisors would provide help to their students if necessary;

- Besides more young scholars, including some from foreign countries, joining universities in recent years, the mentality of some senior professors (research study supervisors) at universities have also changed in that they are more willing to allow, and put effort into, arranging for their students to gain practical experience in research areas;
- Research topics are more flexible and, hence, are more easily approved by universities. Research students then have more chances to participate in different directions, natures and areas of studies related to IPD;
- While more direct and indirect resources, as well as different natures of outcomes and reputations, can be generated to universities through research students' practice, universities are more willing to initiate reforms in research programmes and provide different types of support to research students' practice outside universities [2][3];
- Due to the increasing trend of education reform in the world and the new trends of education in general, more flexible assessment systems and methods for research studies are being accepted [26-28]. Such changes in research education release the anxiety and worries of research students so that they may be more comfortable with participating in practical projects;
- The mentality of many students in recent years has changed in that they are more willing to undertake more practical work in their research studies. According to the findings of the review of the reform, some students agreed that it was more interesting to undertake practical work. Some realised that such balance in research and practice could widen their perspectives, allowing them to be more flexible for their future prospects, either in the academic field or industry.

### CONCLUSIONS

As with a coin with two faces, the advantages of a balance in research and practice in the research studies in IPD also have limitations, difficulties and drawbacks. However, this should not be used as an excuse to stop educators from having serious considerations and proposing appropriate reform on research programmes in order to meet the continuous changing needs of society.

The discussion above is just a case review on

research studies of IPD in China, and a case study of reform in research studies of IPD in Hong Kong. The history of the reform is short. It is still full of limitations, difficulties and drawbacks, especially regarding implementation. Additionally, it is necessary to have more and continuous reviews and further reform on the current plans and practices. Nevertheless, the outcomes are encouraging.

Some opportunities have been identified in the paragraphs above. It may be obvious that most of the opportunities are associated with the current societal situation, such as more open-minded industries that are more willing to collaborate with universities in research participation.

As mentioned above, research studies in IPD are tightly related to industry, as well as other sectors outside universities. However, this does not block the importance of universities to maintain a high level of autonomy in research. It is only through such kind of autonomy and a certain degree of independence that research studies can bring about more fresh and objective directions, ideas and suggestions to society.

On the other hand, although research studies should not be a slave catering to achieve economic and industrial benefits, IPD, as a subject related to design applications, needs to be sensitive to the changes of the international and local economy and industry, no matter if it is a critical review or a supporting argument. Only this type of sensitivity, as well as a balance in research and practice, can bring about research studies in IPD to succeed in the contemporary and future eras.

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