LEARNING STRATEGIES IN HONG KONG'S SERVICE INDUSTRIES

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This paper seeks to explore the features of emerging learning strategies among consulting engineering firms in Hong Kong. The need for new learning strategies is prompted by changes in the territory’s economic structure and a more extensive demand for improved services. The traditional approach of consulting engineers to learning through the exploitation of existing knowledge and learning-by-doing is examined, and illustrated with a few examples from Hong Kong. The challenges of adopting a more exploratory approach to learning, based on more intensive R&D efforts, is discussed together with the implications for innovation policies.

A few keywords: Service industries, Innovation, Learning, Hong Kong

JEL - code(s). 031, L84, L91

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Introduction

The importance of service industries in advanced economies is now generally recognized, and the improvement of productivity and quality of services will be crucial for sustained economic growth. Increasingly, service firms experience a need for innovation and learning as competitive markets at the national and global level increasingly demand enhanced service products. In economies such as Hong Kong, services now provide the bulk of employment and income for the population. This is the result of the combination of several factors, including the impact of global supply chains extending to China, the rapid economic growth and integration of the Asia Pacific region, and the shift of economic structure in Hong Kong itself. Some characteristics of the services provided in Hong Kong thus derive from the advantages associated with the territory's location on the Asian Pacific rim, and in particular, from its position as an intermediary between the economy of China and global markets. Another crucial factor has been the cultural and linguistic capabilities of Hong Kong firms, which have become dominant suppliers of services facilitating trade or subcontracting manufacture with firms in the Pearl River Delta (Meyer, 2000). These advantages are reflected in relatively high proportion of re-export trade, transport, communications, insurance, and financial services in the composition of the Hong Kong services sector.

Hong Kong was one of the “Four Asian Tigers” – the term which became popular for the newly industrialized economies in East Asia. These economies have been widely
recognized for sustained economic growth, with growth rates of real per capita gross domestic product from 1960 to 1995 sustained at around 6% per year. After rapid growth of industrial activities in Hong Kong during the 1970s, many industrial firms moved their manufacturing units across the border to the Chinese Mainland in the 1980s. The last decade has thus witnessed a structural transformation of the Hong Kong economy that has shifted the core of economic value-added from manufacturing into services, as shown in Table 1.

**TABLE 1: HONG KONG'S GROSS DOMESTIC PRODUCT BY ECONOMIC ACTIVITY (PER CENT)**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Agriculture and fishing</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Industry</td>
<td>25.3</td>
<td>16.1</td>
<td>14.3</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>17.6</td>
<td>8.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Electricity, gas and water</td>
<td>2.3</td>
<td>2.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Construction</td>
<td>5.4</td>
<td>5.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Services</td>
<td>74.5</td>
<td>83.8</td>
<td>85.6</td>
</tr>
<tr>
<td>Wholesale, retail and import/export trades, restaurants and hotels</td>
<td>25.2</td>
<td>26.6</td>
<td>26.1</td>
</tr>
<tr>
<td>Transport, storage and communications</td>
<td>9.5</td>
<td>10.1</td>
<td>10.3</td>
</tr>
<tr>
<td>Financing, insurance, real estate and business services</td>
<td>20.2</td>
<td>24.4</td>
<td>23.2</td>
</tr>
<tr>
<td>Community, social and personal services</td>
<td>14.5</td>
<td>17.3</td>
<td>21.2</td>
</tr>
<tr>
<td>Ownership of premises</td>
<td>10.6</td>
<td>13.3</td>
<td>12.9</td>
</tr>
<tr>
<td>Adjustment for financial intermediation services indirectly measured</td>
<td>-5.5</td>
<td>-7.9</td>
<td>-8.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
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</table>

Source: Census and Statistics Department.

A study by Tao and Wong (2001) analyzing the emergence of producer services (i.e., business services that are directly associated with the production or distribution of goods) in Hong Kong indicates that the growth of these services is closely related to the growth of foreign direct investment from Hong Kong to the Chinese Mainland, and with the
growth rates of Hong Kong's re-exports of goods from the mainland. Such producer services now contribute 50 per cent of real GDP in Hong Kong. The relocation and expansion of producer networks from Hong Kong to the Pearl River Delta has, in other words, supported the development of important producer services such as financial services, insurance, communication and logistics in Hong Kong.

In spite of having experienced "de-industrialization," with the concomitant risks of undermining the potential for economic prosperity as a result of a new international division of labor, Hong Kong's experience confirms recent research that argues that advanced producer services continue to provide significant value added and have become critical to global networks of production (Daniels and Moulaert, 1999). However, the continued competitiveness of Hong Kong's service industries will depend on the value that is provided to clients in terms of reliable, effective and efficient service products, rather than advantages based on geographical location or cost advantages. Hong Kong firms that have thrived on the provision of local services based on cost-effective strategies relying on low-cost labor and localized linkages with clients and suppliers will therefore have to become more innovative, providing new value to their clients. To a significant extent, this change implies a substantial re-orientation of learning among service providers in Hong Kong. Moving from the position as suppliers of conventional stand-alone service products, such as transport, storage or design drawings, to more sophisticated levels of integrated and value-added services, will require new capabilities in terms of cooperative linkages with partners, delivery modes, and/or innovative solutions. Hong Kong firms will need to acquire these capabilities through learning
processes that extend beyond those conventionally practiced in the territory (Yu and Robertson, 2000).

This paper seeks to explore the features of emerging learning strategies among consulting engineer service firms in Hong Kong. The need for new learning strategies is prompted by changes in the territory’s economic structure and a more extensive demand for improved services. In order to do so, we shall briefly review some conceptual definitions and issues associated with learning, emphasizing the transition from exploitation of knowledge to exploration of knowledge. The traditional approach of consulting engineers to learning through the exploitation of existing knowledge and learning-by-doing is then examined, and illustrated with a few examples from Hong Kong. Finally, the challenges of adopting a more exploratory approach to learning, based on more intensive R&D efforts, is discussed together with the implications for innovation policies.

Learning Strategies and Knowledge Accumulation

Concepts and theories of learning vary with disciplinary outlook and the object of research. On the one hand, a considerable volume of literature has been published on organizational learning. This literature is primarily concerned with understanding the processes through which organizations learn and the outcome of learning, for example, in terms of capabilities and competitiveness. On the other hand, disciplines such as psychology have addressed the cognitive aspects of learning, while computer science has
explored algorithms for machine learning. Recent years have also witnessed a series of studies broadly associated with evolutionary economics that seeks to elucidate learning in terms of selection processes which similarly involves cognitive processes.

At the core of most definitions, however, learning is seen as “the act of gaining knowledge.” This idea clearly implies the accumulation of knowledge by an individual or an organization. Evolutionary economic theory has emphasized the cumulative nature of knowledge, as represented by the changes in an organization’s repertoires of operating and dynamic routines. In this perspective, learning can thus be conceptualized as the process by which firms revise existing routines and develop new routines to deal with changing environmental challenges (Nelson and Winter, 1982). Learning is path dependent in the sense that it builds upon previously accumulated knowledge (Levinthal and March, 1993). Behavioral theories describe the search for new routines and the modification of capabilities as the outcome of a learning process.

The effect of learning is thus seen as knowledge “in action”, that is, accumulated in the form of capabilities. These capabilities are associated with individual as well as organizational performance. It is possible to distinguish two types of capabilities, basic capabilities that rest on operating routines, and dynamic capabilities which help modify operating routines (Zollo and Winter, 2002). Dynamic capabilities are reinforced with the development or upgrading of human capital, or they may be improved through the acquisition and absorption of external knowledge. In addition, dynamic capabilities directly contribute to new knowledge and innovation within the organization. Learning
through dynamic routines has thus been seen as closely associated with innovation (Cohen and Levinthal, 1989). Investments in innovation will facilitate learning via absorption of external sources of knowledge (Cohen and Levinthal, 1990). Increasingly, learning and innovation are seen as part and parcel of firm's competitive strategies, resulting in dynamic positioning in increasingly competitive markets.

There is another important tradition related to learning which emphasize cognitive processes. Some of these approaches, such as theories of knowledge creation (Nonaka and Takeuchi, 1995) emphasize the combination and internalization of tacit and codified knowledge. Others have examined various processes of understanding and implementation of learning, such as the concept of double-loop learning (Argyris, 1992). The key point that emerges from this extensive tradition is a conceptual distinction between the “learning” in the sense of simple accumulation of preexisting knowledge, and “learning to learn” in the sense that new knowledge is generated. The latter approach requires a reconfiguration of mental models and systematic methods for testing or verifying new knowledge. It is a much more dynamic and self-sustaining type of approach, which is increasingly identified as the core of innovative behaviour.

Our understanding of such cognitive aspects of patterns of learning thus helps us distinguish various levels of sophistication related to learning capabilities. At the most basic level, learning is the straightforward adoption of new knowledge, providing a skill that enable individuals to carry out predefined operating routines. For organizations, this level of learning would be associated with the introduction of a machine or the copying
of a procedure from another organization. In the terminology of March (1991), this level of learning may be characterized as “exploitation” of knowledge. At a more sophisticated level, learning aims at changing routines and generating new knowledge. Such learning implies the questioning of the existing body of knowledge, the search for new or recombined knowledge, and the extension of frontiers of knowledge. In other words, a more sophisticated strategy for learning will emphasize “exploration”. A similar conceptualization of various levels of sophistication in learning strategies can be found in Kim (1997), who shows how Korean organizations have moved from a duplicative imitation stage to a creative imitation stage, and finally how some firms have reached the innovation stage. It is in the innovation stage that a high intensity of efforts aimed at generating new knowledge will be achieved, and where learning thus predominantly involves “exploration”.

For the purposes of this paper, we shall focus in particular on the transition from “exploitative” learning strategies to strategies of “exploration”. The service industries have traditionally been adept at learning through adoption of standard procedures or techniques developed in advanced firms or public institutions, and have often concentrated on the effective exploitation of this knowledge for their competitive advantage. In recent years, however, competitiveness in services often require firms to enhance the process of development of new services, and thus stress creative and innovative approaches. These types of approaches demand new competence for interdisciplinary work and rely increasingly on the ability of firms to explore potential design options or new sources of technology.
Knowledge Accumulation and Exploitation in Consulting Engineering

Knowledge accumulation depends critically on the resources that firms command; in particular, the knowledge that is available (internally in the organization or from external sources) or need to be created. Mobilization of knowledge includes the sourcing of knowledge through recruitment and training of engineers or other experts, by the establishment of platforms for interaction among participants in a project and with external agents, or through the professional community. Engineers base their work on the sort of skills required to do calculations, prepare drawings and presentations etc. through formal channels, schools, professional institutions, on-the-job training, or self-study. Professional certification procedures are typically based on educational records, various examinations in specialized subjects, and documented experience in practical project work including design or supervision (e.g., Constance, 1988).

Knowledge accumulation in engineering consultancy firms impinges directly on the level and patterns of innovation. The primary characteristic is the fact that the human resources are critically important for the success of engineering consultancy firms (Boxall and Steeneveld, 1999). The competitive assets of engineering consultancy firms reside primarily in the skills of their staff, and are thus contingent on the quality and capabilities of their human resources. Patterns of knowledge creation and accumulation in the engineering consultancy sector exhibit many of the characteristics associated with knowledge-intensive professional services, such as a strong dependence on human resources, the vital importance of tacit knowledge, and the key role of experience and
reputation (Lowendahl, 1997). Moreover, the processes of knowledge creation involve extensive sharing of both tacit and explicit knowledge that is similar to patterns observed in other business sectors. These aspects of knowledge accumulation are reinforced by the need to recruit engineers who can communicate and interact creatively and widely in order to support innovation. Many small firms in the sector are simply based on the expertise of one or a few engineers. Larger firms usually organize their production and delivery of services through project teams of certified engineers with a long-term experience in specialized areas of engineering, who embody the tacit knowledge as well as the stock of formal knowledge accumulated in the organization.

The reliance on exploitation of preexisting knowledge, which is often embodied in the expertise of employees, has had a tendency to support a pattern of knowledge accumulation that is gradual and often characterized by largely tacit elements. The project team will usually be composed of senior engineers that have built up their specialist knowledge of the design through many years of practice, combined with a group of engineers who are still in the process of learning (Wearne, 1993). The profession also emphasizes this aspect of practical experience in the requirements for certification as a chartered engineer. To a large extent, knowledge management in engineering consultancy firms focus on recruitment, training and retaining of engineers who are keen to continue to expand and enhance their knowledge base. Their services rely heavily on their professional expertise, acquired through formal education, continuing professional development, and hands-on experience. Through the design process, for instance, the engineers apply scientific knowledge to solve problems derived
from the clients' requirements. Scientific knowledge may entail mathematical calculations, geometric analysis, etc. Subsequently, ideas, concepts and, in some case, analyses are presented in the form of visual interfaces that call for unique computer skills. Materials are engineered such that they perform to the clients' requirements. Knowledge of this kind is often explicit in nature, although it may frequently be presented in a visual form (Henderson, 1999).

Most new technologies are introduced as part of solutions of design problems in specific projects, rather than as a result of the output of research undertaken in specialized laboratories. The relations between parties engaged in innovation in various phases of planning, design and construction are highly complex, yielding an intricate pattern of client-agent relationships. The processes of learning involved in construction innovation often rely on the experience that users acquire in the implementation of a project (Slaughter, 1993). The nature of the construction industry, its common practices, as well as the role of networks are also important aspects that shape the knowledge accumulation process. Owners of new projects primarily focus on the end result in terms of costs and benefits. Construction costs are often of such paramount importance for them that functionality, aesthetics and so forth become less of a concern. While public organizations and regulators are held accountable to the general public and hence worry about the public benefits such as health and safety. Contractors are responsible for putting the design concept into a concrete practice. Buildability, construction costs, and time schedules are directly related to the profitability of the project for each of the contractors. With such varying interests in construction projects, these groups of industry participants
are required to come to consensus on a design. Communications processes involving
groups of businesspersons, professionals and regulators of diverse interests are bound to
be complicated, and all these factors obviously influence and constrain the knowledge
creation process.

The institutions of consulting engineering in Hong Kong has been deeply influenced by
the colonial past, that is, the British system of engineering education and practice. Hong
Kong engineering consulting services have drawn on British expertise to provide services
to the local construction sector, and this pattern of exploitation of existing knowledge can
be seen as a crucial factor for raising quality and efficiency in construction. At the same
time, however, engineering firms in Hong Kong are now largely staffed with locally born
and educated engineers, and they operate on East Asian markets – including the Chinese
Mainland – where many social and cultural values are deeply embedded in traditional
patterns of behavior. This raises important issues about the potential tensions between a
"global" professional culture and the cultural values of the organizations and societies in
which consulting engineers carry out projects. Still, a handful of international firms
dominates the market for engineering service in Hong Kong. In particular, large firms
such as Arup has a unique culture that promotes innovation, placing specific focus on
their human resources. When hiring, the firm tries to look for graduates with different
backgrounds to promote diversity. In addition to the normal trainings and professional
development routines that engineers go through, Arup actively tries to arrange for staffs
to work in different environment to enrich their experience. If needed, they could be
seconded from one office to another on a project-to-project basis. On top of staff
relocation, the firm’s internal systems such as skill networks, intranets, and regular publications serve as the backbone on which knowledge is stored and disseminated. These can be regarded as necessary features to supplement the knowledge creation process.

**Towards Learning Strategies for Exploration**

On account of the inherent fragmentation of the traditional construction process, however, the production of a design is an intricate process where many considerations and demands must be considered, and the resultant configuration will embody compromises and synthesis of many strands of knowledge (Gann and Salter, 2000). Innovative consulting engineers are frequently confronted with situations and constraints that are idiosyncratic and particular for each project. At the same time, engineers also need to exercise discretion at certain points during the design process and preexisting decision rules or knowledge may not always be available. In addition, elements such as aesthetics tend to rely on subjective evaluation that are difficult to quantify. Attributes like comfort or beauty cannot be easily evaluated following explicit rules. In construction design there is thus increasingly a human element of instinct and subjective judgment that links processes of engineering with the creation of art. To a large extent, experienced engineers recognize that design process can become very intuitive in nature (Hough, 1996). Imagination is part of intuitive knowledge, and the processes required to put this type of knowledge to work are frequently tacit. During the process, engineers often visualize their ideas and concepts in their mind or as draft drawing, and they base their decisions on a gut feeling about the
strength of a structure, the attractiveness of a solution, and the feasibility of a new technique.

Creativity is therefore becoming essential for innovation in engineering design, and indeed has been identified as the key contribution of engineers to good design (Addis, 2001). Creative ideas may arise in completely new situations or as a result of completely new demands. Normally new ideas are first of all explored in internal meetings in the engineering consulting firm. It is a necessary step because modern construction projects usually involve sophisticated, multidisciplinary teamwork. The complexity of most projects also makes it essential that an idea is thoroughly explored, considering all impact that it may have on the entire system, before it is brought up in meetings involving clients or other partners (Winch, 1998). Such consultations with partners and clients generally require more explicit conceptualization of the ideas involved in the project. More innovative firms typically continue the knowledge accumulation process by means of liaison meetings where all the consultants including the consultant team that agreed internally on the design, together with the architects, quantity surveyors, and so forth. At this stage, meetings are not totally formal as the key is to share their knowledge and ideas consulting teams usually include the ones it has good working relationships with. Information is presented in oral or written formats; and, team members are free to investigate ideas until a consensus is reached. After the consultants settle down with their concepts, they would present them to the clients to get their feedback. Innovative activities in engineering consulting firms are frequently carried out in relation to construction projects and tend to be integrated in system-wide work (Groák, 1992).
Personal interaction remains a primary source while ICT tools have become important complementary means rather than substituting for face-to-face meetings (Salter and Gann, 2001).

The challenges to knowledge accumulation and management presented by the forces of complexity in project management, requirements for multidisciplinary competence, and closer integration with partners in a project framework are indirect, yet powerful. Consulting engineers are increasingly required to develop skills in planning and management of projects that involve large and significant social, economic, or communicative issues – such as preparing a master plan for urban renewal or environmental management. Projects increasingly involve financial risk, or competence in securing financial support. Collaborative ventures and partnerships are becoming increasingly popular in major construction projects, and the skills of flexible leadership and cooperation are therefore grow to be of great significance for the long-term competitiveness of consulting firms.

The complexity of production and products generated in the engineering consulting sector tends to support incremental innovations introduced in the course of project work, rather than radical innovations that would lead to a fundamental overhaul of services and business. Each new design, new material or new construction method needs to be aligned with a vast number of other variables in the final product, and there is often limited opportunities for the consultant to engage in extensive testing of the effects of an innovation. Therefore, innovative ideas are usually implemented with as much precaution
as possible, and a continuous stream of incremental improvements or optimisation efforts is an approach that usually lends itself better to meeting the requirements of clients than propositions demanding major, system-wide changes in the product or construction processes.

Projects involving advanced engineering design in Hong Kong have become increasingly complex during the recent decades. The construction of the Mass Transit Railway system was initiated in the 1970s constituted a highly complex undertaking involving 25 major civil engineering and 10 electrical and mechanical engineering contracts, which amounted to a total sum of HK$5.8 billion, excluding interests and other finance costs during the period of construction. New technologies such as diaphragm walling and compressed air tunneling were introduced, and complex issues of construction in congested urban areas with severe restrictions in working space, acceptable noise levels and vibration had to be solved. The complexity of planning and construction of new towns in the New Territories presented another major challenge to engineering consultants. However, the most extensive and complex project to date has been the construction of a new airport at Chek Lap Kok in the 1990s. This undertaking, known as the Airport Core Programme (ACP), was composed of a system of 10 projects, strategically designed to erect and connect the replacement airport on Lantau Island to various locations in the territory and to provide land for other developments. At the cost of US$20.6 billion, the 10 ACP projects included the construction of terminal buildings, a railway and an expressway to the Central district, and bridges, reclamation and housing projects. Although most engineering design projects in Hong Kong do not project
represents such extreme complexity, the difficulties associated with construction in congested areas, under difficult geo-technical conditions, and with multifarious environmental surroundings are usually challenging.

The use of information technology has not fundamentally altered these aspects of the knowledge creations process in engineering consultancy. However, new modes of interacting and new services have clearly emerged from the spread of ICT-based systems in the firms. For the bigger firms, such as Arup, Scott Wilson and Atkins, computer software is heavily used to supplement traditional ways of processing and presenting designs; in some cases, ICT is used to add new services to their core businesses. These technologies rely on tacit knowledge that is turned into concepts and prepared as explicit knowledge for presentation and communication with clients and other partners. Much of the CAD software for technical drawings, computations, and simulation is utilized to significantly improve the process of knowledge creation and to improve operational efficiency.

**Concluding Remarks**

The consulting engineering services in Hong Kong are in the process of transition, as the emerging service economy of the territory is shifting towards knowledge-intensive growth and extending its reach into the Chinese Mainland. While a learning strategy based on the exploitation of existing knowledge and expertise, epitomized by the contributions of employees with basic training and practical experience and the inputs of
expatriate human resources, has functioned rather well in the process of early industrialization and expansion of public infrastructure, the challenge of advanced infrastructure design and interdisciplinary project implementation is posing new requirements to the firms. The largest firms in the sector have therefore been increasingly forced to emphasize innovative and creative approaches to project design and delivery. This is leading to new learning strategies based on exploration, and will demand a range of new skills among employees in the sector. This change also carries with it important implications for the universities that are training engineers in Hong Kong, as they will need to be brought up in a new, creative environment and will increasingly be exposed to situations requiring an attitude of exploratory knowledge acquisition.
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