Abstract
In a volatile economic climate, firms rely on their dynamic capabilities to adapt to rapidly changing conditions and shape new market opportunities. This paper reports the findings of an inductive longitudinal process study (2005-2010) based on 74 interviews, 300 newspaper articles from the UK, US and China, and numerous internal documents. Our findings reveal how a global professional service firm entered and shaped an emerging market for integrated sustainable urban solutions. The in-depth case study enabled us to construct a conceptual model of capability transformation. Previous studies have unravelled the outcome of organizations developing capabilities in dynamic environment, yet, the underlying process of capability transformation in entering and shaping a nascent market remains poorly understood. We found that three mutually enabling sets of activities; renewal, reuse and reinforcement, constitute the cornerstones of dynamic capabilities and thus support and facilitate the process of capability development. Renewal of capabilities is required to enter and shape the emerging market by searching, exploring and envisioning novel solutions, which result in radical or incremental changes in resource configuration, competencies, internal structures and decision making processes. Reuse of capabilities entails redeploying the newly-built capabilities to serve new products, projects or markets. This is a phase of iteration and exploitation where new capabilities are employed in projects across industries and geographical regions to test their resilience and provide learning feedback. Reinforcement of capabilities refers to the activities undertaken internally to gain internal organisational support for the renewed category of capabilities and externally to build institutional support, while challenging established norms and rules, to shape the nascent market. We suggest that the three sets of activities mutually interact with each other over time. Our model has implications for theory development of dynamic capabilities and offers insights for managers grappling with how their organization should think strategically and in a systematic way to build a business in a nascent market, in domains such as clean technology, low carbon energy and integrated sustainable urban development.
ABSTRACT
As volatile economic climate stirs up global market turbulences, firms rely on their capabilities to innovate their products, processes, and perhaps most importantly their organisations to address the external changing market. Past studies have pointed their focus on the enterprises developing capabilities in dynamic environment (Teece et al., 1997, Eisenhardt and Martin, 2000, Helfat and Peteraf, 2009, Zollo and Winter, 2002), but the process of capability transformation in entering and shaping a nascent market remains poorly understood. We argue that three mutually enabling sets of activities, including renew, reuse and reinforce, can support and facilitate such process of capability development. Renewal of capabilities involves searching activities and developing new alternatives, which results in radical or incremental changes to firms’ capabilities to adapt to the emerging market; Reuse of capabilities entails redeploying newly built capabilities to serve new products, projects or markets; Reinforcement of capabilities refers to gaining internal support for the renewed category of capabilities and conducting institutional entrepreneurship to shape the nascent market. We also assert that the three sets of activities mutually interact with each other, with renewal and reuse of capabilities likely to be commenced first and reinforcement of capabilities slightly lacks behind. Analysis of an inductive, longitudinal process study on a professional service firm entering and shaping an emerging sustainable urban development market from the period of 2005 to 2010 supports our conceptual model.

Keywords: organisational capabilities, dynamic capabilities, organisational learning, renew, reuse, reinforcement, nascent markets, competitive advantage
1. INTRODUCTION

In a volatile economic climate, firms rely on their organisational capabilities to adapt to rapidly changing conditions and shape new market opportunities. Previous studies identify how large incumbent firms rely on dynamic capabilities to diversify and grow in new technologies and markets (Teece, Pisano and Shuen, 1997) and how new entrepreneurial start-ups follow paths of capability development (Helfat and Peteraf, 2003). However, the underlying and detailed process of capability evolution to not only enter and build a new business, but also “shape” a nascent market remains poorly understood.

This paper reports the findings of an inductive longitudinal process study (2005-2010) based on semi-structured interview data and archival data. Our findings reveal how a global professional service firm PROENG entered and shaped an emerging Eco-city development market through delivering integrated sustainable urban solutions. The in-depth case study enabled us to construct a conceptual model of capability transformation. We found that three mutually enabling sets of activities; renewal, reuse and reinforcement, constitute the cornerstones of dynamic capabilities and thus support and facilitate the process of capability development. Renewal of capabilities is required to enter and shape the emerging market by searching, exploring and envisioning novel solutions, which result in radical or incremental changes in resource configuration, competencies, internal structures and decision making processes. Reuse of capabilities entails redeploying the newly-built capabilities to serve new products, projects or markets. This is a phase of iteration and exploitation where new capabilities are employed in projects across industries and geographical regions to test their resilience and provide learning feedback. Reinforcement of capabilities refers to the activities undertaken internally to gain internal organisational support for the renewed category of capabilities and externally to build institutional support, while challenging established norms and rules, to shape the nascent market. We suggest that the three sets of activities mutually interact with each other over time. Our model has implications for theory development of dynamic capabilities and offers insights for managers grappling with how their organisation should think strategically and in a systematic way to build a business in a nascent market, in domains such as clean technology, low carbon energy and integrated sustainable urban development.

2. THEORETICAL CONTEXT
‘The Organisation of Industry’ authored by George B. Richardson conceptualized the fundamental role of organisations are ‘to specialize in activities for which their capabilities offer some comparative advantage’(Thornton and Ocasio, 1999). Organisational capabilities have been referred as critical factors explaining firm-heterogeneity, competitive advantage and differential performance (Barney, 1991, Wernerfelt, 1984). Through Nelson and Winter’s (1982) lens on ‘What firms can do as a collective’, organisational capabilities literature covers a large body of study and a range of constructs such as resources, capabilities (Penrose, 1959, Wernerfelt, 1984, Helfat and Peteraf, 2003), competences and routines (Nelson and Winter, 1982, Grant, 1996, Eisenhardt and Martin, 2000, Selznick, 1957, Dosi et al., 2000). Some scholars characterized it as established practices of allocating tangible and intangible resources on the firm level; others address it a set of routines which must have reached some threshold level of practiced activity.

How firms sustain competitive advantage in the context of environmental change is characterized as a Holy Grail question within Strategic Management domain (Chandler, 1992, Teece et al., 1997, Winter, 2003). The recent focus on the issues of volatile markets, environmental uncertainty and changes has shifted scholars’ attention to review the field of organisational capabilities. The evolution of organisational capabilities calling for the ability to change and develop implicates the promise of ‘a new theory in the making’ – dynamic capabilities view (DCV) of the firm (Teece et al., 1997, Eisenhardt and Martin, 2000, Zollo and Winter, 2002, Winter, 2003, Teece, 2007, Helfat et al., 2007). The ‘dynamic’ term is devoted to addressing the continuous renewal of organisational capabilities, thereby matching the demands of (rapidly) changing environments.

**The past literature of Dynamic Capabilities**

Research on dynamic capabilities has popularized in the past two decades. Through the following literature review, we find the past conceptual development of dynamic capabilities differentiated and overlapped with each other, which is constructive for us to understand the phenomenon how organisations change and develop their own capabilities to adapt or even change the external dynamic context.

The very first fundamental literature defining dynamic capabilities was published by Teece, Pisano, and Sheun, 1997. It was the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments that comprises dynamic capabilities. Teece et al (1997) conceptualized dynamic capabilities into three dimensions:
positions, paths and processes. Positions refers to firm’s internal and external available assets; paths represents existing established routines in the organisation evolved from the past; while processes are devoted to coordinating and integrating resources on one hand and organisational learning and reconfiguration of resources on the other. Extended from the original definition (Teece et al., 1997), dynamic capabilities were defined to fill in the boundary gap of Resource-based view in the situation of high-velocity markets. Eisenhardt and Martin (2000) furthered the concept to the drivers behind creation, evolution, and recombination of resources serving as the antecedent organisational routines. They indicated dynamic capabilities not only respond to exogenous change but also create market change. It is not only an adaptive process but a proactive process to change the external environment.

Organisational learning was also depicted as a source of dynamic capabilities (Zollo and Winter, 2002). The learning mechanisms, specified as experience accumulation process and cognitive processes (knowledge articulation and knowledge codification), behave as higher order search routines that facilitate the creation and modification of dynamic capabilities (Collis, 1994), and branded as ‘second order’ dynamic capabilities (Zollo and Winter, 2002); dynamic capabilities (first order) are dedicated to the modification of operational routines (zero order) and all of three forms a capability hierarchy.

While looping learning processes as part of entrepreneurial activities in organisations, Zahra et al. (2006) revealed the scholar’s intention to highlight the entrepreneurial characters of dynamic capabilities to create, define, discover and exploit opportunities. We found that Zahra et al (2006) purposefully set up the boundary of dynamic capabilities in a way to stress that the dynamic capability does not guarantee organisational success or survival. Dynamic capabilities were clearly made separations from substantive (or ‘ordinary’) capabilities of a firm which highlight that a new routine for product development is a new substantive capability but the ability to change such capabilities is dynamic capabilities. The angle Zahra et al. (2006) emphasized echoes with Winter’s (2002, 2003) work that simply characterizes dynamic capabilities as a higher-order capability. The dynamic capabilities operate to extend, modify or create ordinary (substantive) capabilities. We found that from Zahra’s work, dynamism of the capability itself was suggested to be focused, not the environment.
After the influential paper published in 1997, Teece explicated the microfoundations of dynamic capabilities and disaggregated the notion into three main sets of micro-processes: sensing opportunities, seizing opportunities and reconfiguring resources. The three managerial processes (integrate, build and reconfigure) illustrated in Teece and Pisano (1994) and Teece et al. (1997) paper are refined to become a sub-set of the processes that support sensing, seizing opportunities, and reconfiguring resources. This definition is consistent with the view of Zahra et al (2006) that enterprises with dynamic capabilities are intensively entrepreneurial (named ‘evolutionary fitness’ in Helfat et al., 2007). Meanwhile, Teece endeavors to provide an avenue to enter a strategic choice perspective (Child, 1972) acknowledging the responsibility of managers for the actions of the firm (Ghoshal, 2005), which was included in Zahra’s concern. While much effort was put on sub-processes fitting entrepreneurial characters, Teece excluded ‘technical fitness’ (Helfat et al., 2007), or ‘substantive’ capabilities (Zahra et al., 2006) in his definition. Helfat et al (2007)’s definition was a synthesis of those highly influential but evolving views of dynamic capabilities (Helfat and Peteraf, 2009). The definition accommodates Teece et al’s (1997) view that dynamic capabilities facilitate firms to respond to market change. It also leaves the possibility that organisational changes can be driven by endogenous entrepreneurship irrespective to external environmental change. Clustering those alternatives, Helfat et al (2007) specifies dynamic capabilities act upon resources in the organisations, consistent with previous building-up.

Taken together, the research effort on understanding dynamic capabilities can be categorized into three main focuses: 1) antecedents to developing dynamic capabilities (i.e. entrepreneurial behavior, sense and seize opportunities); 2) routines, processes and practices that enable dynamic capabilities (i.e. resource reconfiguration, organisational learning); and 3) paths from dynamic capabilities towards competitive advantage. Dynamic capabilities were recognized as higher order capabilities over substantive (core) capabilities owned by firms.

**Capability transformation to enter, grow and pioneer in nascent markets**

Existing capabilities are fundamental to facilitate organisations to compete in the business environment. Without renewal, such core competencies would become rigidities constraining firms to be competitive in the future (Leonard-Barton, 1992). The notion of dynamic capabilities provides inspirations to analyse motivation and underlining process of how organisations proactively renew their capabilities in the dynamic context. However, any entrepreneurial pursue of opportunities to renew existing capabilities would like to stretch the
organisations beyond the boundaries of their core competencies and result in poorer performance (Hoskisson et al., 1991). Leonard – Barton (1992) expressed the challenges broadly as an organisational paradox while Helfat and Peteraf (2003) elaborated organisations would run through a capability lifecycle when they confront the challenges of renewing their existing capabilities. In Helfat and Peteraf's capability lifecycle (CLC) model, after the initial lifecycle from founding stage to development stage and maturity stage, further evolutionary path of the original capability is greatly affected by various selection events. These branches, the six Rs of capability transformation, form the general patterns and paths in the evolution of organisational capabilities over time. Although Helfat and Peteraf’s (2003) paper provides a comprehensive approach to outline main features of capability evolution; however, the paper doesn’t detail the process of how one capability will evolve in a particular setting. Thus our research interest, how organisations enter, grow and shape new business environment have not been adequately addressed. (more to follow in this section)

3. RESEARCH METHODS

Data Collection

Our three-year research project (2007-2010) involved 71 interviews with senior and project managers in PROENG, local Chinese academics, practitioners and policymakers, and senior managers in the client organisation. The semi-structured interviews addressed PROENG’s involvement in the Orientalbeach project and its attempts to transfer of capability to subsequent eco-city projects in China and elsewhere in the world. Typically we began with querying interviewees about the key decision making processes and the project influences exerted on the organisation. Most interviews ranged from half an hour to two hours. The interviews were recorded and transcribed into more than 1500 pages, if not, extensive notes were taken. Generally we had two or three researchers present at the interviews for the purpose of minimizing single interviewer bias (Bailar et al., 1977). Moreover, we conducted the interviews with some of the interviewees more than once to track the project progress and personal judgement at different points of the timeline (Welch et al., 2002). We tracked the development of the project management team to identify more key interviewees who were crucial to our data collection.

The interview process can be summarized into three phases. From late 2007 to late 2009, 52 interviews were conducted with senior managers mostly from PROENG and third parties in the Orientalbeach project. We questioned individuals from different disciplines within
PROENG about their personal experiences of the project. We found the consensus about the same events and facts was high although interviewees provided different perspectives of PROENG’s involvement in the project, i.e. transport planning versus logistic design. We matched the key facts quoted in the interviews with the information in the archival documents to elaborate PROENG’s milestones in the project into a timeline flowchart (Lieberman and Montgomery, 1988). During this phase, two field trips to Chinese client and PROENG local office offered us the opportunities to improve and validate our understanding of the project. In the second phase, May 2010, we expanded our range of interviewees to more Chinese collaborators and carried out 9 additional interviews with Chinese academics, practitioners and policymakers. Because the data collection in the second phase happened after the completion of Orientalbeach project, these semi-structured, formal interviews provided us with broader insights and third-party perspectives after the events. During this phase, we gathered the information of PROENG’s involvement in the later stage of Orientalbeach project, and how PROENG moved to global Eco-city business at the post-Orientalbeach stage. In the third phase, from July to October 2010, a member of our research team worked as a secondment in an entrepreneurial eco-city consulting firm. The company was founded by people who used to work as key personnel on Orientalbeach project in both PROENG and the Chinese client. The researcher spent three months in the field, taking extensive field notes and interviewing third parties who used to work for or collaborated with PROENG on Orientalbeach project and the following other eco-city projects. At the end of this period, we collected 71 interviews in total for our research (Appendix A).

**Methods**

The research design is an inductive, longitudinal process study on a single case (Langley, 1999). Firstly we followed grounded theory method to write a case study on PROENG’s Orientalbeach project and emerging Eco-city business. The study detailed the founding, history, values and vision of PROENG, followed by a close look at PROENG’s Eco-city business in the period of 2005 - 2010. From such perspectives, we provided a ‘thick’ description for this narrative story rather than theoretical variables. Secondly we used process methods to produce theoretical constructs from our in-depth study (Abbott, 1988). While identifying order and sequence of observed activities, we sought answers to what are the antecedents, main processes and consequences of PROENG’s involvement in Orientalbeach project. In doing so we aimed to identify and unpack primary generative mechanisms that had the power to cause the observed events to happen.
We carried out the process study by adopting an inductive single case study approach for two reasons. First, while being aware of the difficulties of building theory from one in-depth case we selected PROENG’s Orientalbeach case due to the uniqueness and novelty of the phenomenon (Siggelkow, 2007). The unprecedented challenge of defining and solving the problem of how to design a zero-carbon city in China makes this an unparalleled case (Yin, 1994). Second, the complex organisational and social interactions observed in the case make the dynamism unapparent and obscure. An inductive approach helped to understand and clarify the complex process of capability development in this setting by drawing inferential links between data and theory. (Appendix B)

4. CASE STUDY

Eco-city development as a nascent market in build environment industry

The built environment industry is one of the most influential industries in shaping modern economies and contributes significant value of its goods and services to Gross Domestic Product. In recent decades, threats to the sustainability of the Earth’s natural environment and rapid urbanization have brought heavy pressure as well as new opportunities to the industry. On one hand, evidenced by a six-year study from the Intergovernmental Panel on Climate Change (IPCC), greenhouse gases, particularly carbon dioxide (CO2) as by products of industrialisation –are responsible for global Climate Change. On the other hand, since 2008, for the first time in human history, more people live in and around cities than rural areas (Report from HM Government, 2008). While cities drive the engine of the global economy, cities are also responsible for most of energy consuming cars, offices and homes which are wasteful and inefficient. High income countries face up to the problem of refurbishing aging infrastructures to support their economic growth while low and medium income countries need to handle the pressure of growing population into urban cities. With environmental problems getting worse every year and relentless march of urbanisation (especially for those populous countries), greater sustainability has been raised as the heart of the policy and of the standards in the built environment.

In 2009, McKinsey Global Institute published a forecast that there will be 350 million people becoming new urban residents in China by 2025, imposing unprecedented pressure on its urban development. Experts agreed that a new urbanization model ensuring smart and environmental friendly urban growth would be crucial in the incoming years. To meet this need, there are about 30 sustainable urbanization projects at various stages of development
throughout China. As quoted by Peter Head, director of PROENG’s Global Planning group, “China is moving in the direction of eco-cities because it sees this as a route to create a sustainable economic future.”

In response to global challenges of rapid urban growth and climate change, a new phenomenon in built environment industry – Eco-city development (also called ‘ecological urban development’) has emerged and attracted increasingly more attention since a decade ago. Eco-city development, heavily supported by multi-parties and governed by particular mechanisms, is considered as a complex, dynamic and co-evolutionary innovation process, instead of just a simple outcome (Joss, 2010). Challenges of sustainable criteria in the emerging market of eco-city development have shifted the focus from planning approaches prior to the execution of construction projects towards environmental impacts of the job. Traditionally urbanization includes a standardized process of building or assembling of infrastructure; while the emerging market requests sustainable considerations to be coherently integrated with the existing established practices along the stages of scheduling, budgeting, site safety and logistics. Such changing context – people attempt a sustainable way of living – has urged a global community of organisations to come together to take actions.

During the global transition towards a more sustainable future, business organisations have identified a range of technical solutions to reduce energy demand and shift towards zero or low-carbon technologies. However, organisations find it uneasy to take a medium or long-term view of these solutions since they have to balance today’s economic needs with investments fulfilling environmental needs over decades. Moreover, sustainable urban development market (or called Eco-city market) is ambiguous and uncertain with many market segments not being properly delineated and regulations not being standardised, which becomes major challenges to those who vow to shape a more sustainable future.

**PROENG’s Orientalbeach project and its Eco-city business**

PROENG, founded in 1946, is a multidisciplinary engineering consultancy with designers, planners, engineers, consultants and technical specialists offering a broad range of professional services. The firm exerts a significant influence in built environment industry given the credit from its achievements in numerous prestigious projects such as Sydney Opera House in Australia, Channel Tunnel Rail Link (France-UK), Millennium Bridge in UK and 2008 Beijing Olympics. In 2004, Chinese client Jiangzhou Industrial Investment Co., Ltd. (ZHONGSHANG) approached PROENG to mastermind the first design phase of
Orientalbeach Eco-city, powered by renewable energy sources and as close to carbon-neutral as possible.

Orientalbeach project was initiated against the background that five-year plan of P.R. China was drafted based on the guiding principle ‘sustainable development’. The president of China, Hu Jintao, told the People's Congress in 2005 that “China has to overcome the problems of environmental pollution and resource depletion”, adding that current development trends were 'environmentally unsustainable'. Such bold initiatives from central government, which Orientalbeach aimed to be in line with, are particularly influential and important in China\(^1\).

Initiated as an experiment to create a carbon-neutral city from scratch and prototype for the future of all cities in China, Orientalbeach project focuses on the ambitious goals to deliver long term ecological sustainability as well as economic vitality and prosperity. The new eco-city planned to locate in sensitive wetlands on Chongming Island at the mouth of the Yangtze River just north of Jiangzhou. Its first phase, a marina village of 20,000 inhabitants, targeted to be unveiled at the 2010 World Expo in Jiangzhou. By 2020, nearly 80,000 people were planned to inhabit the city’s environmentally sustainable neighbourhoods and half a million by 2050. Orientalbeach project firstly targeted planning 630 hectares, roughly three times the size of the City of London. The planning content included a transport hub and port which would accommodate fast ferries from the mainland and the new Jiangzhou airport, a leisure facility, an education complex, space for high-tech industry and housing etc. Two major goals of the project were to generate zero carbon emissions and cut average energy demands by two thirds via a unique city layout, energy infrastructure and building design.

In 2005, former British Prime Minister Tony Blair and Chinese President Hu Jintao signed a contractual agreement to develop the world's first “eco-city” Orientalbeach and also collaborate on sustainable development projects in the future. Jiangzhou Industrial Investment Corporation (ZHONGSHANG), a state-run pharmaceutical and real estate investment firm firstly hired McKinsey & Company to be involved in the project. With the recommendation of McKinsey, ZHONGSHANG employed London-based PROENG to take the lead design role in Orientalbeach eco-city development. After that, ZHONGSHANG and PROENG signed partnership agreements with HSBC and UK investment bank Sustainable Development Capital LLP (SDCL) for financing.

\(^1\) Geoff Dyer, *China to ‘pioneer first sustainable city’*, Financial Times Sept. 15, 2006
PROENG then formed a strategic partnership with ZHONGSHANG and was commissioned to provide a full range of services for the Orientalbeach project, including “urban design, planning, sustainable energy management, waste management, renewable energy process implementation, economic and business planning, sustainable building design, architecture, infrastructure and planning of communities and social structures.” 2 PROENG and ZHONGSHANG also signed a memorandum of understanding (MOU) with the University of East Anglia carbon reduction team in the UK to collaborate on the Orientalbeach Sustainable Technologies and Renewables (STAR) Project. Other collaborating firms involved are construction company Davis Langdon, environmental development firm Eco-Energy Cities, Monitor Group, and the Climate Group etc.

Echoing the broad idea from ZHONGSHANG “to skip traditional industrialization in favour of ecological modernism”, ZHONGSHANG PROENG relationship developed from the traditional client - consultant relationship into a major framework that delivered sustainable development for the whole China (not only the Orientalbeach project but also other projects such as Tangye New Town masterplan (2005), Wanzhuang conceptual planning (2006), Zhujia Jiao Integrated Planning (2007), and Huzhou conceptual plan (2007).

In addition to the emerging business opportunities between UK and China, Orientalbeach project also provided an unsurpassed opportunity to research and capture all aspects of the eco-city development including the consultation, planning and design stages and the implementation phases of such a project. A jointly organised EPSRC/PROENG workshop (Nov 2006) resulted in the formation of EPSRC Orientalbeach research networks to allow UK researchers such as Imperial College, UCL and Southampton University to collaborate with Chinese researchers and jointly submit research proposals to appropriate funding bodies. In addition to facilitating the research network, PROENG contributed by feeding project information, technical expertise and administrative support.3

3http://www.epsrc.ac.uk/ourportfolio/themes/engineering/introduction/sue/Pages/Orientalbeachresearchnetworks.aspx
5. RESEARCH ANALYSIS AND FINDINGS

Our research findings enabled us to identify and analyse three mutually enabling sets of activities to support PROENG’s capability build-up in the dynamic nascent context. These include: renewal, reuse and reinforcement of capabilities.

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Renewal of capabilities:

Our data revealed that PROENG renewed their capabilities through a discovery process including identifying different emerging problems at different stages of Orientalbeach project from 2005 to 2008. During each stage, PROENG was busy with delivering partial solutions to the emerging burning problems and then tried to integrate them with previous solutions. Despite the fact that PROENG undertook an explorative process to work on the Orientalbeach project, the philosophy of adopting a holistic approach was always the principle PROENG referred to. In the capability renewal phase, PROENG created new knowledge and skills of how to mastermind Eco-city development through a few double-loop learning iterations. However, the organisation had limited chances of exercising their new design methodology in a single project, which could hardly be considered as reaching the threshold level of capabilities. In this section we will explain the external pressures and internal endowments which preconditioned PROENG to start their capability renewal process. Following that we will unpack the actions that PROENG took to renewal their capability of delivering Eco-city planning solutions in this section.

Trigger for capability renewal

Interviewees in PROENG suggested the trigger for renewing capabilities originated from two aspects; 1) external pressure forced the firm to revamp their existing capabilities, and 2) internal organisation environment as the turf for capability renewal (resource availability and agents’ vision).

The first trigger is the external pressure exerted on PROENG at the broadest level. As discussed previously, sustainability has been increasingly formulated as the essence in volatile global business markets, especially in the built environment industry. The macro-cultural trend in shaping a sustainable future have provided important raw material for PROENG to review the competitiveness of their existing practices in the dynamic markets. On the other hand, undertaking the first world Eco-city project exposed PROENG to a complete nascent business environment in its early formative phases (Santos and Eisenhardt, 2009). Compared
to the organisations who strive to change in the established built environment industry, PROENG faced a set of different challenges when they tried to carve out the nascent Eco-city field. PROENG was pushed to the frontier of ambiguous settings where there were no existing industry standards, undefined design items, and no benchmarking to refer to. For any organisation, it was a fuzzy frontend where most market segments were not properly delineated and local regulations were not available. Being occupied by the creative thinking to produce a unique solution to the Orientalbeach project, PROENG needed to integrate the reality of risks, finances, skills and locations into their design considerations. They had to coordinate different kinds of parameters of industrialisation, liaise with Chinese local authorities, and collaborate with different local parties to set up their design parameters. Adding to the above, the Chinese client ZHONGSHANG, a local experienced real estate developer, was lack of experiences of managing concessions of a greenfield urban design and bringing them to financial closure. Malcolm Smith, the director of Urban Design London group, explained the significant challenges was embedded in a very different social and political context in China compared to Western countries, and that was what PROENG needed to adjust their strategies to adapt and respond.

“I mean it goes back 1,500 years to this kind of landscape relationship. And it’s much more fundamental and then all of a sudden what you realise is that the Chinese is industrialising at a speed five times quicker than what Europe went through. So they (Chinese political leaders) are just going to use the Eco-city development to ... (testify) the agenda of the ... post-China Industrial Revolution ... why does China become the first country in the world to promote an eco-city response and mobilise it on scale? And why we do struggle to mobilise that agenda in a debate here? One of the reasons is very simple: they’re living through the implications. We’ve gone through the implications ... so the eco-city response is very different.”

In short, the combination of macro-cultural discourses (Lawrence and Phillips, 2004), the ambiguities and uncertainties in the nascent setting and the work embedded in a very different socio-political context prompted PROENG to adjust their established practices and explore viable solutions.

The second trigger for capability renewal came from the internal environment. The sheer depth of PROENG’s diversified technical resources and agency’s vision and ambition have provided PROENG with solid turf to take on the challenges of capability renewal. Peter Head, PROENG’s director of Global Planning group, considered the intellectual personal
knowledge and the depth of experiences in diversified disciplinary fields provided key support for PROENG to explore new practices and develop new capabilities.

“the international reach and the quality and the sheer brilliance of those people is actually fundamental ...the sheer depth of the other skills, water, energy, waste, transport... a huge depth of experience ...There’s a real sort of depth of skill there which enabled us to do it.”

Peter also envisioned the ambition to integrate those diversified knowledge and experiences to form new capabilities,

“we had a consulting division and a planning, integrated planning business ...in the sense of no other consultant in the world, as far as I know, has joined all these skills together into a single business unit.”

Mechanisms for capability renewal

To respond to the challenges, PROENG engaged in an explorative and trial-and-error process of radical innovation. Where possible, PROENG used the few examples of small-scale zero-carbon urban design pilot projects found elsewhere in the world. It was a discovery process that PROENG delivered partial solutions at different stages when they confronted popping up issues such as cultural planning (2005), economic modelling (2006), financial investment (2007) and mitigation of capital risks (2008). Although these partial solutions were incremental innovations to solving the Eco-city planning problems, the integration of these partial solutions to form a holistic design was actually a breakthrough innovation. In order to achieve that, the organisation found they had to amalgamate both urban design and technical engineering strategies simultaneously to form the technical solutions. Compared to regional development, cities are such complex systems that have multiple components interrelated to each other. Defining and solving the problem of creating a zero-carbon city required the ability to combine multiple components, such as transport, energy, waste, water, health, education, business and administrative functions, into an integrated urban system. In addition to the technical solutions, PROENG also had to integrate new sources of socio-economic knowledge, such as cultural planning, economics, and business development. Almost all interviewees highlighted that PROENG met the challenge by developing a radically new multi-disciplinary approach known as the “integrated sustainable design” methodology, supported by various skills, a new matrix organisation and digital tools.

Our interview analysis showed that PROENG’s capability renewal was underpinned by four activities (See Figure 1), all of which were aimed at facilitating knowledge creation and configuring resources to exercise the knowledge to form new capabilities. We found the first
two activities were consistent with the notion of ‘combinative capabilities’ by Kogut and Zander (1992) and the next two activities fit into the framework of organisational learning and knowledge creation (Argote and Miron-Spektor, 2011, Argote, 1999).

The first dimension concerns the creation of internal business networks to recombine PROENG’s existing capabilities. The capability recombination coheres with the notion of knowledge recombination in innovation (Kogut and Zander, 1992), which facilitated PROENG to handle the new challenges by transforming old capabilities into new ones. In order to develop an innovative design approach, PROENG established a new business unit called ‘Integrated Urbanism’ as a platform to re-arrange their internal resources into a matrix consisting of cross-cutting themes. The new business unit was created based on the project requirement that specialists from different technical backgrounds had to collaborate very closely because the results of any technical analysis would be the assumptions for others. Furthermore, PROENG created a digital modelling system called ‘Integrated Resource Model’ (IRM) to help the new business unit to set up and monitor the planning process on the same baseline without compromising any disciplinary input. The new ICT tool quantified how good a proposed design performs relative to already propose units, systems and interfaces in an easily comprehensive manner. According to the evidence provided from interview transcript and archival documents, two other ICT tools (SPeAR and UMF) were concurrently created to enhance the integrated design process and improve PROENG’s capability of resource management.  

The second dimension, introducing new elements into the current capability framework, known as acquisitions to recombine capabilities (Capron et al., 2001), was also essential to support PROENG’s capability renewal. For example, our interviewees indicated PROENG set up Jiangzhou local office to add the local cultural planning element into the design framework. PROENG also added financial and risk management services into the turnkey service package and they even acquired people who had knowledge of governance and public policy to strengthen and broaden the sphere of their team’s planning capability.

4 Sustainable Project Appraisal Route (SPeAR) was designed to assist setting sustainability objectives, tracking sustainability of projects along its lifecycle and assessing alternatives where a decision needs to be supported. Urban Management Framework (UMF) was particularly initiated to make sure the operational roles to deliver integrated urbanism design are considered at the early planning stage.
The third and fourth dimensions ‘learning from the past’ and ‘learning by doing’ highlight the organisations’ activities to imitate knowledge that exists in past experiences or other similar projects/products. Both dimensions point to a high level of organisational learning, since the project teams have never performed the activity before. We found that PROENG adopted a combined explorative and exploitative approach. They captured relevant lessons from previous sustainability related projects and integrated them into Orientalbeach project; they allocated people with related past experiences to the design teams; they compared and adopted some of the previous practices into the Orientalbeach project. Also, PROENG learnt and improved their new practices when working on the project. They worked out some initial results and testified them through multi-interfaces with various parties. The two dimensions ‘learning from the past’ and ‘learning by doing’ are consistent with the past literature of organisational learning (March, 1991), however, relatively little empirical research have related the theories of organisational learning to the development of organisational capabilities in particular.

In summary, PROENG took ‘capability recombination’ and ‘organisational learning’ actions to renew their capacity to perform a new particular task, Eco-city planning (Helfat et al., 2007). The result of capability renewal were significant in multi-aspects, but can be mainly outlined into improvements in design capabilities (a radically new multi-disciplinary design system known as “integrated sustainable design” supported by various skills and digital tools) and recourse management capabilities (managerial decision making process supported by a new matrix organisation system and ICT tools). Our data analysis suggested renewal of capabilities was necessary for firms to enter and shape the emerging market. By searching, exploring and envisioning novel solutions, organisations would result in radical or incremental changes in resource configuration, competencies, internal structures and decision making processes.

**Reuse of capabilities**

**Trigger for capability reuse**

A capability is only qualified when it reaches some threshold level of practiced activity, thus the basic path of capability development reflects a process of capability improvement (Helfat and Peteraf, 2003). In the renewal phase, PROENG underwent a couple of double-loop learning processes to explore the novel solutions to planning an Eco-city socially, environmentally and economically sustainable. The novel knowledge and experiences gained from Orientalbeach project formed the cornerstone of PROENG’s new design and resource management capabilities,
nevertheless, such knowledge and skills were practised in one project only. Since mature capabilities involve habitualised action patterns working in a reliable manner (Dosi et al., 2000), PROENG implemented reuse strategy as a crucial step in developing, testifying, and improving their renewed capability.

PROENG was awarded to work on a number of Eco-city projects as well as sustainability related projects all over the world at the later stage of Orientalbeach project. The relationship with the client ZHONGSHANG was further developed for the purpose of transferring the traditional client–consultant relationship into a major framework aiming to deliver sustainable development across the whole China. For example, the parameters, concepts, and IRM tool was tested and redeployed in Ebbsfleet project, in which PROENG delivered a 7.4 million ft² integrated masterplan surrounding Ebbsfleet International Station on behalf of Land Securities. Ebbsfleet project was the first project that PROENG charged the client at the cost of using IRM. The total cost PROENG charged through using IRM tool was smaller than many accumulated small numbers submitted by other competitors, which provided implications that adopting integrated design methodology had advantage above the conventional way of master planning. Malcolm Smith, the PROENG director of Urban Design London explicitly raised the improvement in the methodology after redeploying PROENG’s new design capabilities,

“Two or three times of iterations of the whole process (integrated design methodology supported by IRM tool) can get the project humming. Orientalbeach iterated three times and Ebbsfleet iterated twice. This iteration process in the masterplanning stage is able to give the following design a much more advanced cutting edge ... The whole iteration process can be regarded as optimising process ... The difference between this new iteration process locking down and traditional master planning is you have locked down the performance target locked down. You can sell these targets to clients for the purpose of asking for financial support.”

Another example was PROENG’s capability of managing the complex systematic design and the novel design methodology was migrated into Northstowe project. It was the first time that the integrated design methods were tested since its creation. The testament was further carried out in another two Chinese masterplanning projects and Jeddah central area development project. Working on the numerous subsequent projects provided opportunities for PROENG to testify and improve their new-born design approach, and strengthened PROENG’s novel design and resource management capabilities.
According to our interview dataset, respondents reflected both explicit and tacit knowledge were accordingly redeployed when business provided opportunities. However, it was important to bear in mind that the novel knowledge and experiences underpinning PROENG’s new design capabilities were deeply embedded in particular context. In other word, PROENG contextualised their new practices whenever applying them into every different project.

Mechanisms for capability reuse

Interviewees evidenced that PROENG’s redeployed their new knowledge and experiences in different sustainable-related markets or closely related product or service. Capability reuse took the form of transferring and improving new practices across multiple levels. We found the evidences of such capability reuse at project, functional, organisational and regional levels, while not much emphasis were placed at individual level. At the project level, PROENG had worked on 4 Eco-city projects adopting the same design framework developed in Orientalbeach by mid 2009. ‘The total number of Eco-city projects have been increased to 17 and the two digital tools (IRM and SPeAR) have been developed into version 12 and 11 separately’, mentioned by Albeit Wei in mid 2011, a senior sustainable planning consultant in PROENG. At the functional level, evidences show that the constant redeployment of integrated urbanism services at city level also strongly influenced the design capabilities at functional level. Alex Mitchell, a senior environmental consultant considered “the waste strategy for Huzhou will be a lot better because they’ve learned an awful lot from the waste strategy in Orientalbeach. During the next phase of work PROENG will be updating Wanzhuang’s waste strategy and making it much better”. At organisational level, internal organisations were re-structured throughout the reuse phases. For example, people who had previous experiences of working on Eco-city projects were selected into a new network ‘Planning Plus’ while they maintained to be an official member of their own functional team. At the regional level, experienced people in the Eco-city business were encouraged to relocate to lead other regional Eco-markets.

“You know, the transfer isn’t just Europe, it isn’t just China, it’s everywhere – America is all over it, Australia are very keen, we’ve just done a project for an Abu Dhabi client in Malaysia who didn’t know what they wanted, but once they, you know, go through it, recognised the, the benefit to them.” From Roger Wood, Director, Integrated Urbanism team in Planning Plus Group.

During the rolling process of capability reuse at multiple dimensions, PROENG began to realise the new services founded by the new practices (or methodology) cannot only be used
at Eco-city level but actually at any level. Peter Head, Director of Global Planning group stressed that

“(PROENG didn’t provide) eco-city service but just integrated urbanism services. Because the objectives don’t have to be at eco-city level they could be any level. Eco-city is a sort of level of objective really...It’s absolutely the same methodology.”

The reuse of capabilities saw how PROENG confronted the challenge of how to reuse the insights, approaches and tools created for the Orientalbeach project on subsequent projects. The activity involved the identification, selection and transfer of useful tools, techniques and processes across multiple boundaries.

**Reinforcement of capabilities**

Members of the Orientalbeach project had to overcome established industry practices and behaviour by encouraging members of its own organisation and clients to embrace the new way of thinking about sustainable urban designs. We identify that the third crucial set of activities, reinforcement of capabilities was adopted to meet the challenges. Hereby, reinforcement of capabilities refers to the activities undertaken internally to gain internal organisational support and legitimacy for the new business and externally to build institutional momentum to shape the nascent market, while challenging established routines, norms and rules.

**Internal Reinforcement (trigger and mechanisms)**

Any renewal of organisation’s existing capabilities threatened the established orders or impinges the boundaries of established practice groups. Two reasons prompted PROENG to reinforce their newly born capability of integrated sustainable urban design. Firstly the company confronted severe tension between their existing practices and renewed design systems. Peter Head, Director of Global Planning group, addressed the concern that new practices required the alignment of otherwise opposed interests,

“because they’d all have their own targets and objectives and they’d be worrying about, well you’ve changed the scope of work, you know, I’ve got re-negotiate my time and stuff.”

Secondly PROENG’s senior managers were aware of the importance of Orientalbeach-like projects for developing their own functional team capabilities.
To respond to the two initiatives for capability reinforcement, our interview analysis addressed four mechanisms for the activities of internal reinforcement, 1) strategic positioning the project within the organisation; 2) arranging internal workshops and conferences; 3) developing specialised sustainability-related capacities at functional level; and 4) redeploying the design concept to reinforce internal confidence as mentioned in the previous section. All the four mechanisms indicated PROENG aimed to internally fight against scepticism and resistance from some of PROENG’s senior managers about the viability of “integrated urbanism” as the best way of building the firm’s eco-city business.

External Reinforcement (trigger and mechanisms)
On one hand, PROENG have restructured its internal activities, processes and structure to continue following the trajectory of capability development and install confidence and belief in the direction of the trajectory. On the other, the firm has also engaged in external activities to shape and promote the new concept, building its leading role in the nascent market.

Based on our interview analysis we found two reasons triggered PROENG to externally reinforce their distinguished competency obtained from working on the Orientalbeach project. The first reason was mainly for the purpose of capitalising company’s first mover advantage in the nascent Eco-city market. While PROENG developed pioneering competency to enter the nascent Eco-city field, they were aware that the logic of the new design approach behaved as a misfit with the conventional practices in the established built environment. This was because conventional planning processes tended to focus on one issue at a time – a stop and go process - and too often the impact of one system on another system or property is ignored until the consequence becomes a reality. Contradictory to traditional planning process which took architectural or urban planning as the centre of the design criteria, the integrated design methodology dealt with supply and demand between quantities. Thus, the new design approach didn’t have a spatial element in its model. Moreover, market competitors with multi-disciplinary resources would likely to gain similar knowledge and skills in the near future.

The second trigger was deeply embedded in the concern about the cultural differences between eastern and western world. A lot of interviewees have implied the pressure of working in the very different social and political environment prompted PROENG to explore radically innovative solution to reduce ambiguities and uncertainties in the nascent field,
nevertheless, the market-based solutions cannot fully cope with the scope of settling the social and political differences in the understanding of values.

In response to the two initiatives for capability reinforcement in the external environment, that PROENG devoted great amount of effort to promote their innovative design philosophy and methodology as a viable solution in the emerging Eco-city market. PROENG was actively involved in the public activities and branded the newly established design principles as their turnkey service package. They claimed that the methodology would be crucial to deliver holistic solutions to the emerging Eco-city market. Furthermore, they were involved in the entrepreneurial actions to promote, legitimate and shape new norms, rules and regulations in the emerging institutions. The analysis of media coverage of PROENG approved that PROENG became a dominant pioneer in leading and shaping the market trajectory of Eco-city development during the period of 2005 – 2008.

Externally PROENG were in social and political struggle to legitimate their novel approach as well as the emerging Eco-city market. They also faced fierce competition from late comers at market and institutional level. In response to those, PROENG made a market-based approach including market promotion for related products and renewal of organisational identity. Furthermore, PROENG adopted a social-political approach to engage with public discourse, academic institutes and social and political settlement within the nascent Eco-city market.

6. DISCUSSION AND CONCLUSION

Sequencing of Renewal, Reuse and Reinforcement of Capabilities

In our proposed three R model, we purposefully allocate the three sets of capability building activities mutually interacting with each other, instead of emphasizing the sequences of the three activities. Since the Orientalbeach project was considered as a milestone project for PROENG, we observed that the organisation entered into the renewal phase firstly. PROENG was involved in an exploratory process of radical innovation, resulted in the development of a radically new multi-disciplinary approach known as the “integrated sustainable design” methodology, supported by various skills, a new matrix organization and digital tools. The renewal phase was closely followed by the organisation’s reuse and reinforcement activities, although it was difficult to identify which of the following two activities commenced first. Therefore we created two possible sequencing models of the three activities and analyse how
the three activities were linked up not just in our case, but more generally. (more to follow in this section)

------------------------ Insert Figure 7 about here ------------------------

**Linkages between Renewal, Reuse and Reinforcement of Capabilities**

**Linkage between Renewal and Reuse activities**

How well a renewed capability is maintained depends on how often and how consistently a firm exercises the capability. The reuse strategy replicate, testify and improve the renewed capabilities through exercising them across organisation, project, and function levels.

**Linkage between Renewal and Reinforce activities**

After firms have effectively developed new capabilities through renewal strategy, firms are still unlikely to realise real value creation unless they leverage these capabilities in the organisations and marketplace. The reinforcement strategy stabilizes recursively a pattern of renewed capabilities to help with the organisational capability building.

**Linkage between Reuse and Reinforce activities**

Firms interchangeably use capability reuse and reinforce strategies. They reinforce their renewed capabilities through reuse strategy and also reuse those capabilities through reinforce strategy in the process of organisational capability development.

(more to follow in this section)
7. REFERENCE


Figure 1. Learning, Dynamic Capabilities, and Operational Routines (Source: Winter and Zollo, 2002)

Figure 2. Evolutionary and Path Dependent Processes in Dynamic Capability Development (Source: Zahra et al., 2006)
Figure 3. Renew, Reuse and Reinforce – building capabilities in nascent markets
Figure 4. Explorative Data Analysis for Mechanisms underpinning Capability Renewal

**Capability Renewal (mechanisms underpinning the ‘renew’ process)**

**1st Order Informant Concept**
- Project teams were arranged in a matrix consisting of cross-cutting themes (birth of ‘integrated urbanism’ business unit)
- People were selected into a new network group called ‘Planning Plus’ while they maintain to be a member of their own functional team
- Added financial and risk management services to existing design-dominated capabilities
- Jiangzhou office was set up to respond to the need for local culture understanding
- Jiangzhou project pushed PROENG to acquire resources who have political and governance knowledge/experiences
- Capture relevant lessons from other projects and transfer and integrate them into one place at one time
- Allocate people with relevant experiences to work for the Jiangzhou project
- Consultation with the specialists who had experiences of working on Dubai waterfront and Doha regeneration
- Adopt similar education system approach implemented in Weitzman Institute of Israel to design economic model
- Apply part of the integrated waste system in Majorca into Jiangzhou project
- Work out some initial results and test them through multi-interfaces with varied parties
- The design of Jiangzhou project is a dynamic process with multi-interactions and strong customer-focus

**2nd Order Dimension**
- Internal business networks creation to facilitate the resource re-integration and new acquiring
- Recombining existing capabilities and other knowledge
- Extension from existing frameworks – introduction of novel design elements
- Learning from the past experiences
- Organisational learning

**3rd Order Dimension**
- Explorative learning process – learning by doing
Figure 5 Explorative Data Analysis for Trigger and Mechanisms underpinning Internal Capability Reinforcement

**Capability Reinforcement** (catalyst to trigger the process of capability reinforcement within organisations)

**1st Order Informant Concept**
- Organisational inertia, tension from internal politics representing different group interests
- The people within PROENG didn't realise the extended value of Jiangzhou
- Opportunities for different group teams to develop their own functional capabilities
- Exchange the renewed practice to reinforce the renewed design philosophy (reuse strategy)
- Unusual to renew a project at a board level
- Jiangzhou played as not only a commercial project but a research project
- Jiangzhou acted as an effective way to attract good human resources
- Jiangzhou inspired PROENG not to just consider urban designers, architects and engineers to recruit, but also social economists and historians etc.
- Jiangzhou regarded as an ideal platform to reorganise teams to meet upcoming demands. It can hardly be achieved by R&D projects in project-based firms
- Jiangzhou is considered as part of DNA of PROENG
- To PROENG Jiangzou is as exceptional as Sydney Opera at strategic level
- Jiangzhou is internally considered as a live lab for PROENG
- Jiangzhou helped PROENG to detect new business opportunities
- Jiangzhou helped PROENG to move into a new market.
- PROENG got paid off by winning a lot of.

**2nd Order Dimension**
- Tension between traditional organisational practice and the new design management system
- Opportunities to strengthen capabilities
- Reinforce renewed design capability/philosophy
- Reinforce renewed resource management capability
- Organisational level—reinforce through strategic positioning the project within the organisation
- Reinforce renewed organisational identity internally and extend new business opportunities

**3rd Order Dimension**
- Catalyst triggering internal reinforcement of renewed capabilities

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Figure 6 Explorative Data Analysis for Trigger and Mechanisms underpinning External Capability Reinforcement
Capability Reinforcement (mechanisms underpinning the ‘external reinforce’ process)

1st Order Informant Concept
- The most amazing market bits for PROENG and a demonstration platform to attract work
- Purposefully push the brand of Urban Information Management into the market
- The level of media exposure to Jiangzhou is totally different from majority of PROENG’s projects
- Half-information-feeding market strategy
- Use Jiangzhou to set up PROENG’s eco-city badge
- Help Chinese to tackle climate change is
- Jiangzhou set up a global agenda for the new way of thinking, design, and making business strategies
- It was a coincidence that the world shifted its focus on climate change at the same year when Jiangzhou project was launched
- The business and governance model developed from Jiangzhou project was implemented to different territories all over the world
- Outreach from engineering elite towards an influential global player from a more policy and governance perspective
- Peter Head shall not be viewed as an engineer but a politician
- None of PROENG’s competitors have adopted policy-based approach by hiring politicians related and international business area related people to the group
- Work with foresight group to gain knowledge from projects in built environment
- Engagement with key academic institutions
- Set up engineering doctorate programs
- Research program on city logistics

2nd Order Dimension
- Media/market promotion for the products associated with Jiangzhou project
- Media/market promotion for renewed organisational identity/brand
- Engagement with public discourse
- Engagement with social and political settlement of the new market

3rd Order Dimension
- Capability reinforcement through actions in the external environment
- Collaboration with public sectors and academic/research institutes
Figure 7. Two possible evolutionary models of Renewal, Reuse and Reinforcement activities
### APPENDIX

**Appendix A: List of Interviews recorded and transcribed (the first 20 number of interviews for demonstration)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Date</th>
<th>Affiliation</th>
<th>Job title/Function</th>
<th>Description</th>
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<td>PROENG</td>
<td>Director of Planning</td>
<td>Face to face, UK</td>
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<td></td>
<td></td>
<td>PROENG</td>
<td>Project Manager of Orientalbeach project</td>
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<td>Feb. 2008</td>
<td>PROENG</td>
<td>Project Manager of Orientalbeach project</td>
<td>Face to face, UK</td>
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<td>5</td>
<td>Feb 2008</td>
<td>PROENG</td>
<td>Senior Urban Designer</td>
<td>Face to face, UK</td>
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<td>6</td>
<td>Feb.2008</td>
<td>PROENG</td>
<td>Head designer of Orientalbeach Integrated Urbanism</td>
<td>Face to face, UK</td>
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<td>7</td>
<td>Feb.2008</td>
<td>PROENG</td>
<td>Senior Urban Designer</td>
<td>Face to face, UK</td>
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<td>8</td>
<td>Feb.2008</td>
<td>PROENG</td>
<td>Senior Economist, Associate</td>
<td>Face to face, UK</td>
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<td>9</td>
<td>25th March</td>
<td>PROENG</td>
<td>Cultural planner</td>
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<td>Face to face, UK</td>
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<td>SDC Investment</td>
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<td>PROENG</td>
<td>Network Coordinator</td>
<td>Face to face, China</td>
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<td>Monitor Consultants</td>
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<td>16</td>
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<td>PROENG</td>
<td>Network Coordinator</td>
<td>Face to face, China</td>
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<td>17</td>
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<td>Tongji University</td>
<td>Advisor to Jiangzhou Municipality on Orientalbeach project</td>
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<td>Tongji University</td>
<td>Professors</td>
<td>Face to face, China</td>
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<td>Construct</td>
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<td>Second-order Dimension</td>
<td>First-order Informant Concept</td>
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</tbody>
</table>
| Capability Renewal in the emerging sustainable urban development market | Internal Catalyst to the renewal of PROENG’s capabilities | Existing rich and diversified capabilities | 1) Diversified international sustainable-related experiences from key individuals (interview with Peter Head)  
2) The sheer depth of other skills (interview with Peter Head)  
3) The consulting division and an integrated planning business which joined all these skills into one business unit (interview with Peter Head)  
4) Heads of PROENG logistics and waste management were very interested in the opportunities of working on Orientalbeach as they considered it as a good opportunity to develop their team’s capabilities (interview with Braulio) |
| | | Agency’s vision | 1) It was Peter who already had the idea of integrated urbanism in his mind and made use of the project to demonstrate the idea. (interview with Peter Head)  
2) Orientalbeach acts as a catalyst to consolidate PROENG’s previous vision on IT management business. (interview with Volker Buscher)  
3) The new business unit ‘integrated urbanism’ was created when a few things happened simultaneously including 1) urban renaissance report on the topic of future cities, 2) PROENG Associates on Stratford City project, and 3) most importantly, Peter’s on board brought invaluable vision and power (interview with Malcolm Smith) |
| | External Catalyst to the renewal of PROENG’s capabilities | Challenges of working in the unfamiliar social and political context / communication difficulties | 1) Unclear instructions from the Chinese client  
   a. Unclear instructions about objectives, vision of the project; about how to carry on thinking and when to stop optioneering (interview with Elaine Trimble, Nicola White, Alejandro Gutierrez)  
   b. Unclear instructions about the delivery responsibilities (i.e. who will be responsible for public infrastructure delivery in Orientalbeach) (interview with Elaine Trimble)  
   c. Client struggled to justify the decisions made in the project (interview with Elaine Trimble)  
   d. Client didn’t get the planning permission from the government (interview with Elaine Trimble)  
   e. Client inexperienced in submitting a proposal with all concessions managed (interview with John Miles)  
2) Limited access to local data  
   a. Limited data access to cost related information for PROENG’s business model design (interview with Elaine Trimble)  
   b. Limited access to local employment rate (interview with Nicola White)  
   c. Limited access to the information of local supply chains (interview with John Miles)  
   d. No data available anywhere in terms of how much movement of freight happens in city (this unavailability not only happened to Orientalbeach area but even to developed places such as London. Eco-city design is so demanding that it requests the detailed dataset which is above the current development level (interview with David Briggs)  
3) Regular changes in the design process  
   a. China is undergoing a transition process. Relevant local regulations keep updating and changing (Interview with Braulio)  
   b. redo work and re-evaluate things due to late change of requirement (Interview with Braulio)  
4) Huge gap in the aspects of language and culture  
   a. language and cultural difference made PROENG unsettled (interview with Nicola White)  
   b. PROENG needed much time and effort to get along with the people they worked with and to make those people understand their work (interview with John Miles)  
   c. PROENG faced a stubborn attitude from the Chinese client that ZHONGSHANG are not good at accepting changes (interview with John Miles) |
| | | Design challenges | 1) Communication (interview with Nicola White)  
2) Complexity (interview with Braulio)  
   a. balancing ecological aspirations and practical risks (interview with Malcolm Smith)  
   b. hard to make all information inputs work harmoniously (interview with Malcolm Smith)  
   c. need to take culture, religion into considerations (interview with Malcolm Smith)  
   d. In sum, unprecedented requirement of designing Orientalbeach into a liveable city satisfying social, cultural, economic and environmental perspectives (from architectural as usual design to negotiated urbanism – interview with Malcolm Smith)  
3) Uncertainty  
   a. Over budget due to too much unknown information. Other consultancies would have stopped working but PROENG didn’t (interview with David Briggs)  
4) Innovativity |

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<tbody>
<tr>
<td>a.</td>
<td>The project seemed to be a test side which contained too many precedents. Difficult to pass through planning permission (interview with John Miles)</td>
<td></td>
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<tr>
<td>b.</td>
<td>Lack of previous experiences (in delivering control plan) (interview with David Briggs)</td>
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<td>c.</td>
<td>Resource management (interview with David Briggs)</td>
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