

11-2007

# The dynamics of implementing and managing modularity of organizational routines during capability development: Insights from a process model

Shan Ling PAN

*National University of Singapore*

Gary Shan Chi PAN

*Singapore Management University, garypan@smu.edu.sg*

Adela CHEN

Ming Huei Hsieh

**DOI:** <https://doi.org/10.1109/tem.2007.906854>

Follow this and additional works at: [https://ink.library.smu.edu.sg/soa\\_research](https://ink.library.smu.edu.sg/soa_research)

Part of the [Accounting Commons](#), and the [Management Information Systems Commons](#)

---

## Citation

PAN, Shan Ling; PAN, Gary Shan Chi; CHEN, Adela; and Hsieh, Ming Huei. The dynamics of implementing and managing modularity of organizational routines during capability development: Insights from a process model. (2007). *IEEE Transactions on Engineering Management*. 54, (4), 800-813. Research Collection School Of Accountancy.

**Available at:** [https://ink.library.smu.edu.sg/soa\\_research/694](https://ink.library.smu.edu.sg/soa_research/694)

This Journal Article is brought to you for free and open access by the School of Accountancy at Institutional Knowledge at Singapore Management University. It has been accepted for inclusion in Research Collection School Of Accountancy by an authorized administrator of Institutional Knowledge at Singapore Management University. For more information, please email [libIR@smu.edu.sg](mailto:libIR@smu.edu.sg).

# The Dynamics of Implementing and Managing Modularity of Organizational Routines During Capability Development: Insights From a Process Model

Shan L. Pan, Gary Pan, Adela J. W. Chen, and Ming H. Hsieh

**Abstract**—Past research using the resource-based view of a firm suggests that it is important to consider how firms develop, manage, and deploy resources and capabilities to influence the overall process of strategy formation and implementation. Relatively little research has been conducted in conceptualizing how firms implement and manage modularity of organizational routines during capability development. Yet, most companies would benefit from implementing modularity in organizational routines when competing in dynamic market conditions. Such implementations may require fundamental organizational reorientation that incurs significant coordination costs, and in some cases, such modularization attempts may fail, costing organizations significant amounts of valuable resources. This study seeks to conceptualize how modularity of organizational routines can be achieved during the capability development process. We inductively develop a process model of modularization, using qualitative data of an in-depth case study of the capability development experience of a call center. The model reveals that modularization is a complex process, whereby an organization's key functional activities are decomposed into specific operating and strategic routines that are reconfigured iteratively during the process of capability development. Practitioners may derive strategies and tactics from our findings to help them implement and manage the modularity of organizational routines during capability development so as to achieve sustainable competence in fast-moving marketplaces. Researchers should be able to use and develop the theory further with new case studies.

**Index Terms**—Capability development, case study, modularity, routine.

## I. INTRODUCTION

**M**ODULARITY, as a design approach to complex organizational and technological systems, has drawn growing attention. This paper inductively develops a process model of modularization, whereby an organization's key functional activities are decomposed into specific operating and strategic

routines that are reconfigured iteratively during the process of capability development. This paper provides some insights into how organizations can better compete in dynamic environments by applying the modular design principle.

The growing importance of global markets and the increasing tendency for competitors to think and act globally have increased the pressure on firms to obtain significant competitive advantage in order to gain a strong foothold in worldwide markets. Competitive advantage can come from many sources, including a firm's overall management talent and organizational capabilities [32]. The heterogeneity in capabilities and resources among firms has been commonly explained by the resource-based view (RBV) [5], [18], which perceives firms as bundles of resources from which sustainable and rent-generating organizational capabilities can evolve [5]. To compete in today's volatile business environments, the dynamic characteristics of how organizations adapt and respond to changing markets have become extremely crucial [26], [42], [50]. While the processes of organizational adaptation and adjustments to dynamic market conditions may involve several complex issues [38], one major feature that contributes to a firm's high agility and flexibility in such market conditions is the adoption and implementation of the modularity concept in organizational process designs [45].

Modularization has been proposed as a key principle for firms adapting to dynamic markets [51]. The modularity concept was initially introduced in the engineering management domain [34] as the decomposition of a product design into loosely coupled modules by specifying standard interfaces that define the inputs and outputs that flow between interacting modules [51]. Besides product development, the concept of modularity can also be extended to the design of information technology architecture [21], [30]. More importantly, modularity has profound implications for organizational routines and processes. Organizational routines can be described as "repetitive, recognizable pattern of interdependent actions, involving multiple actors" [15, p. 95]. The modular process architecture can be considered to involve the decomposition of a company's key activities into specific routines and interfaces that allow frequent reconfiguration of processes [37]. While dynamic organizations mix and match resources to meet unique customer needs [22], the keen competition faced by organizations has made it paramount to conceptualize the dynamics of implementing and managing modularity of organizational routines during capability development to achieve sustainable competence in

Manuscript received May 1, 2005; revised November 1, 2005, February 1, 2006, October 1, 2006, and January 1, 2007. Review of this manuscript was arranged by Department Editor R. Sabherwal.

S. L. Pan is with the Department of Information Systems, School of Computing, National University of Singapore, Singapore 119077, Singapore (e-mail: pansl@comp.nus.edu.sg).

G. Pan is with the School of Accountancy, Singapore Management University, Singapore 188065, Singapore (e-mail: garypan@smu.edu.sg).

A. J. W. Chen is with the Department of Management Information Systems, Terry College of Business, University of Georgia, Athens, GA 30602 USA (e-mail: chenadela@gmail.com).

M. H. Hsieh is with the Department of International Business, National Taiwan University, Taipei 10617, Taiwan, R.O.C. (e-mail: mhhsieh@management.ntu.edu.tw).

Digital Object Identifier 10.1109/TEM.2007.906854

fast-moving marketplaces. Even though previous studies have established the proposition that modularity enhances flexibility of organizational systems in the face of dynamic market conditions [24], [35], there is not a single study that examines the modularization process. Therefore, this paper aims to develop a process model of modularity and its interactions with capability development processes at the firm level.

The research presented here uses a case study as its basis. Our chosen case is Taiwan Teleservices and Technologies (TT&T). Before 1998, TT&T was a business unit (BU) of Taiwan Cellular Corporation (TCC), based in the city of Taipei, Taiwan. Its main function was to provide customers with telephone-based services, such as the activation of new accounts and the management of customer billing accounts. In early 1998, TCC's senior management identified a potential market in providing customers with professional telephony services. A new business entity, TT&T, was established to exploit this opportunity. The new organization was tasked with developing a complete customer call service solution for its potential clients.<sup>1</sup> From 1998 to 2003, TT&T successfully transformed itself from an in-house customer service department to a call center. TT&T accomplished the goal by implementing major changes in its organizational structure and business processes. For example, it rolled out training programs for customer service representatives (CSRs), implemented close work supervision, made process improvements, and put in place a system for more effective manpower allocations. The aim was to achieve high customer service standards. By emphasizing knowledge sharing and retention, TT&T continuously learned from previous experiences and transferred important customer information to its clients. Most importantly, it devised a minimal modification approach, which allowed it to carry out projects involving different industries in a more efficient manner. In short, the measures that TT&T implemented allowed it to integrate and reconfigure its resources, and develop several capabilities to adapt and respond to the transformation of its business. By the end of 2003, TT&T had operations in the cities of Taipei (northern Taiwan), Taichung (central Taiwan), and Kaohsiung (southern Taiwan). It employed 2000 CSRs, deployed 1500 fully equipped workstations, and served more than 7 million customers.

There are at least two important reasons for studying the TT&T case. First, the call center context is suitable for studying the modularity phenomenon because call centers are viewed as "coordinated systems of 'modules' such as people, processes, technologies and strategies" [8], and their modular structures have significant impacts on the design of the tasks and the centers' operating process. For example, the front line work in call centers is highly scripted, unambiguously defined, and relies on converging telecommunication technologies, computer systems, and the Internet (or intranet) that resembles the "modularized work centers" in assembly line productions [41]. Second it is important for firms in the call center context to be able to adapt to their dynamically evolving environments because firms need to optimize work flows, improve productivity, and deploy

technologies to meet rapid changing client specifications and requirements [1]. Successful call centers have recognized that the "best strategy" for capability development involves mixing and matching resources so that resources can better be deployed to meet diversifying client demands [39]. Overall, the TT&T case provides an opportunity to demonstrate how the loose coupling relationship among various functional modules made modularization possible and provided TT&T with flexibility and agility during capability development.

The remainder of this paper is organized as follows. We first explain the concepts of RBV, dynamic capabilities, and modularity. Next, we describe our research approach. A case description of TT&T follows, where we analyze how modularity of organizational routines can be achieved during capability development process. We conclude by highlighting the implications of our findings for both research and practice, with an indication of the limitations of this study and suggestions for future research.

## II. THEORETICAL BACKGROUND

### A. *The Resource-Based View (RBV)*

RBV is an emergent perspective within the field of strategic management that describes a firm as a specific collection of resources and capabilities that can be deployed to achieve competitive advantage [5]. Firm resources are defined as all assets (tangible or intangible) and competencies owned or controlled by the firm that can be used to conceive and implement competitive strategies [22]. A firm's idiosyncratic combination of resources forms the basis of competitive heterogeneity [19], where the scarcity and disproportionate value of resources result in maximum rent generation [3], [18]. Isolating mechanisms must protect firm-specific resources and capabilities from diffusion throughout the industry to sustain existing competitive advantage [48] by making them difficult to be transferred, imitated or replicated, and nonsubstituted by other resources or capabilities that can perform a similar function [5]. RBV has been criticized as being vague and failing to explain how competitive advantage can be sustained in hypercompetitive environments where rapid and sudden changes are common [26], [38], [42]. To address this issue, the dynamic capabilities perspective has been proposed to examine how firms react, adapt, and respond to changes in volatile business environments [42], [50].

### B. *Dynamic Capabilities*

Organizational capabilities are characterized by Teece *et al.* [44] as being dependent on three factors: 1) the coordination/integration, learning, and reconfiguration of organizational and managerial processes/routines; 2) the firm-specific strategic position as defined by the firm's asset structure and resource configurations; and 3) firm history, which accounts for the path-dependent nature of capabilities. Capabilities and resources evolve over time as organizations learn and adapt to change. Interestingly, the type of capabilities developed has been suggested to be dependent on the level of market dynamism within the external environment [13]. For instance, capabilities developed in high-velocity markets, where uncertainty and unpredictability

<sup>1</sup>In this study, we term "clients" to be organizations who are TT&T's direct customers, and "customers" to be direct customers of these organizations.

thrive, are based on comprehensive processes developed through rapid, iterative, and experience-based learning [10].

An organization's strategic approach is crucial to the development of capabilities that would enhance the organization's competitive status [33]. Therefore, studying organizational learning mechanisms that relate organizational knowledge [35] to capability development is crucial for understanding how dynamic capabilities evolve in response to feedback and stimuli from the external environment [53]. The path-dependent nature of dynamic capabilities suggests that repeated practice and incremental learning from small mistakes would eventually lead to capabilities that are complex, difficult to imitate, and responsive to change [13]. Previous studies have shown the existing paucity in research that examines organizations' capability development processes [48]. To date, there is only one process study [29] that provides valuable insights into how an organization develops resources and capabilities to support its business strategy over time. Issues, such as how a firm may swiftly establish its strategic direction, or diffuse and grow a strategy through its ranks, remain unaddressed, and deserve much attention [29]. It is here that the modularity concept can help.

### C. The Concept of Modularity

One important way to examine how organizations adapt and respond more rapidly to dynamic market conditions is to study how firms link together modular resources and capabilities to form resource chains that can respond flexibly to dynamic environmental change [36]. Sanchez and Mahoney [39] define modularity as a special form of design, which intentionally creates a high degree of independence or "loose coupling" between module designs by standardizing module interface specifications. Moreover, firms need complementary organizational resources and capabilities to exploit the "economics of substitution" afforded by modular structures [9] that include a system for continuous improvement of work processes through codification and standardization, appropriate organizational structures, and an infrastructure to facilitate knowledge sharing and reuse such as electronic networks and databases [51].

The principle of modularity has been widely applied in physical settings [9], [51]. However, the concept of modularity can be extended to the intangible areas of process and organization design in the same way [21], [30], [37]. Even though "modular corporations" continue to flourish in major industries and make impressive gains in worldwide competitiveness [45], our literature review fails to find a single process model of modularization during organizational capability development. The prevailing wisdom seems to be that modularization is a complex process, as modular organizations adopt an internal linking mechanism to coordinate the deployment of a range of capabilities and resources that include people, technology, and codified knowledge [35], [40]. Given the knowledge gap, our study aims to provide a deeper understanding of the dynamics of implementing and managing modularity of organizational routines during organizational capability development so as to enable firms to achieve superior competitive advantage in tumultuous and fast-moving environments. The inductively derived model

based on an analysis of the events that transpired at TT&T serves as the central contribution of this study.

## III. RESEARCH APPROACH

We chose a case research approach for our investigation of the research question, as it provides researchers with the opportunity to explore contemporary events in the case company [52]. The case study method is an appropriate means of empirical inquiry when the phenomenon to be studied is complex and not easily separated from its organizational context [25], [31]. Following Eisenhardt [12], we used the case study to build theory in a grounded and inductive manner. We drew on a grounded theory approach [16] to develop theory from qualitative data. Grounded theory is a method of iteratively collecting and analyzing data to develop a substantive theory of a particular phenomenon, followed by a formal theory on its basis. Our case study focuses on the activities involved in the implementation and management of modularity of organizational routines during capability development within TT&T, a large call center based in Taiwan.

### A. Data Collection

Data were collected mainly through personal interviews with the middle and top management, including the General Managers and Directors of the organization (see Appendix A). Personal interviews were supplemented by direct observations, as well as documents and artifacts including organization charts, annual reports, and internal documentation. For example, extensive documentation was obtained from one informant (the General Manager of Customer Service) on customers' satisfaction survey reports. Interviews were based on topic guides, which indicated relevant probes at suitable junctures. Topic guides were customized for each interview. Some sample interview questions are listed in Appendix B. Here, we acknowledge the limitation that interviews as a principal data collection method are problematic since "they are limited to those who are accessible and will cooperate" [49]. To ameliorate this criticism, the interviewees were encouraged to speak freely about how they implemented and managed modularity of organizational routines during capability development. The interviews were retrospective and semistructured in nature. The study drew deeply on the perceptions of the interviewees, as revealed through their interview comments. Historical reconstruction of incidents was subsequently performed by the field researcher. Most interviews were tape-recorded and transcribed, with additional notes being taken where necessary. These texts became the main corpus of the data used for subsequent analysis. Where possible, the researcher also tried to gather other documentary evidence to supplement the evidence gathered from interviews.

One of the authors played the role of a field researcher and collected data at TT&T over three months (April–June 2004). The Deputy Director of Development and Planning provided the access. This led to other interviews at the organization in what may be vividly described as the snowballing effect [7]. Several participants were identified during the initial phase. Interviews were conducted with these individuals and others identified later. Altogether, 22 face-to-face interviews were conducted with an

TABLE I  
OVERVIEW OF THE RESEARCH DESIGN ADOPTED IN THIS STUDY

Research Level	Detailed Description
Strategy	Grounded theory, case study
Main Data Collection Method	Semi-structured interviews
Organization	Taiwan Teleservices and Technologies
Other Data Sources	Field notes; observation; internal documentation
Participants/Informants	Middle and top management (see appendix A for the list of interviewees)
Theoretical Bases	Modularity and Resource Based View of Firms
Research Question	How to implement and manage the modularity of organizational routines during capability development process?

average duration of between 1 and 2 h per interview. The interview transcripts were used for preparing a case summary that was later shown to the Deputy Director, who did not recommend any amendments. The use of the interview transcripts, documents alongside observational data enabled a comparison between the researcher's observations and other informed accounts. These secondary data sources played a crucial role in establishing triangulation and in maintaining the chain of evidence [52]. The field researcher was involved in creating summaries and transcribing the interviews during which the information provided by different interviewees was cross-checked for inconsistencies. Observations of meetings and individuals at work were conducted as a sustained and integral part of the fieldwork. Other informal observations and meetings with employees in their coffee lounge were conducted as well. During these meetings, the field researcher took notes very quickly and transcribed them onto computer files immediately after the session. A case study database [52] was created to organize the data collected in this study. Note that throughout the entire data collection process, intersubject reliability was increased by using the narratives from one subject to confirm or contradict others in social triangulation [28]. But there was no attempt to privilege one account over another. The field researcher judged that there was no overt attempt by the interviewees to systematically conceal details or distort accounts. An overview of the research design adopted in this study is shown in Table I.

### B. Data Analysis

In our data analysis, we sought to use the rich insights available in the case. For any case, insights into the modularization process during capability development can only be obtained from thorough immersion in the transcripts for the case. A detailed case description (narrative as instance) [31] of the entire modularization process was prepared. This was done soon after completing the case study. The process focused on how to implement and manage the modularity of organizational routines during capability development, interspersed with strategies adopted by the company to transform itself from an in-house customer service department to an outsourced call center.

The entire data analysis relied heavily on the database of field evidence that included both primary data (i.e., interviews and notes of observations) and secondary data (web documents,

internal documents, published book series, and multimedia material). As part of the case database, notes summarizing the emerging themes and issues were taken after each interview. Direct quotes from the interviews were classified and compiled according to emerging subthemes. In order to reduce researcher bias and also to validate that no important incident had been missed in the case summaries, the field researcher invited two colleagues to take part in the early analysis of some of the data. Both were uninvolved in the fieldwork, and were, therefore, unfamiliar with the case. The role of the two colleagues was to "bring a different and possibly more objective eye to the evidence" [12, p. 538]. The information they received did not include the field researcher's list of findings. Next, both were asked to develop their lists of findings. A senior information systems researcher was also involved at later stages of the study, giving comments on the field researcher's list. The purpose of this was to detect any obvious bias in the research approach. Data from various sources coalesced and built a specific narrative that explained process outcomes [31].

The next step was to compile a reconciled list of findings, which comprised the key activities that formed the mechanisms of the entire modularization process.<sup>2</sup> The activities were identified by examining how TT&T reorientated its resources and adapted itself to meet market demands. The entire data analysis process was highly iterative. The emerging concepts and themes were identified and developed by moving back and forth between the prior theoretical foundation and the looming themes from the field study [16]. In the inductive generation of theory from data, we triangulated various sources of evidence [52] that is important for concept development in inductive theory building [12]. In the final step of our analysis, we compared our grounded framework to various theories from the dynamic capabilities and modularity literature, and conducted a comparative analysis as suggested by Glaser and Strauss [16]. The iterative process ended when "theoretical saturation" [16] was reached: no additional data were collected. A good example of how we decided "theoretical saturation" was reached was that we identified the organization's continuous improvement in its operations and delivery of services to be emerging operating routines since the interviews with the Manager of BU1, the Chief Consultant of Development and Planning and the customers' satisfaction survey had all reached similar conclusions. Table II summarizes the roles played by both primary and secondary data sources at different stages of our analytical process.

## IV. CASE DESCRIPTION OF TT&T

This section presents the background information about TT&T and highlights the process by which the modular structure of the organizational routines took shape. The case descriptions are presented chronologically in three phases. The section concludes with a summary of the case data.

<sup>2</sup>For example, we categorized modules and routines according to their definitions. Therefore, "Voice Record Auditing" is an operating routine since it was being performed on a daily basis to support the "quality control" component (module) that was an important part of overall customer support services (architecture).

TABLE II  
SUMMARY OF THE ROLES PLAYED BY VARIOUS DATA SOURCES AT DIFFERENT PHASES OF THE ANALYTICAL PROCESS

Phase	Application to the Case	Data Sources
1	Detailed description of the background of the company, long and short term corporate strategies, establishment of call center operation and the development of competitive advantage.	Organization charts, annual reports, internal documents and the interview with the Deputy Director of Development & Planning.
2	<ul style="list-style-type: none"> <li>Focused on the theme of “how to implement and manage modularity of organizational routines during capability development?”</li> <li>Broke the case down into key dimensions:                             <ol style="list-style-type: none"> <li>Resource integrations</li> <li>Operating structures</li> <li>TT&amp;T’s practices (Training, collaborative culture, knowledge integration)</li> <li>Routines formulation</li> </ol> </li> </ul>	Interviews with middle and top management, and internal documents (e.g., customers’ satisfaction survey reports).
3	<ul style="list-style-type: none"> <li>In-depth inductive analysis of multiple data sources.</li> <li>Identified emerging categories and analyzed causal relationships</li> <li>Linked the categories to the modularity, resource based view of the firm, dynamic capability and organizational routine literature.</li> </ul>	Interview transcripts, field notes, direct observation, and internal documents.

A. Phase I: Establishing Direction (February 1998–September 2002)

To briefly recapitulate the earlier introduction of the case organization, TT&T was originally a BU of TCC. Located in Taipei, Taiwan, the BU was founded in February 1998 to provide telephone-based services to TCC’s large customer base. The BU consisted of three subunits—the Front-Line Operations Department, the Sales Department, and the Systems Department. Recognizing the opportunity in the burgeoning call center market, the senior management in charge of the BU made the strategic decision for the BU to separate from TCC and start out as an independent entity. TT&T was established on June 5, 2001. The new arrangement would bring about more autonomy in terms of flexibility in decision making. TT&T’s senior management formulated four major goals. The Director of BU4, one of the BUs at TT&T, explained the goals as follows.

First, to continue the close relationship with TCC, which had accounted for 80% of our income. Second, to achieve and sustain operational efficiency by consolidating and strategizing internal operations. Third, to diversify from relying entirely on telecommunications clients. Lastly, to increase the ratio of outbound business in our revenue scheme, as inbound offerings had only limited margins. (Director of BU4, June 8, 2004, TT&T#18.)

TT&T expanded its range of clients from solely telecommunications companies to organizations in the insurance, airline, government, transportation, and information technology sectors. The market expansion plan is shown in Fig. 1.

Furthermore, several new service products, such as debt collection and telemarketing, were included to satisfy the diverse needs of its clients. TT&T categorized its service products into four types (see Fig. 2): inbound sales (e.g., order-taking hotline), inbound service (e.g., customer query hotline and technical

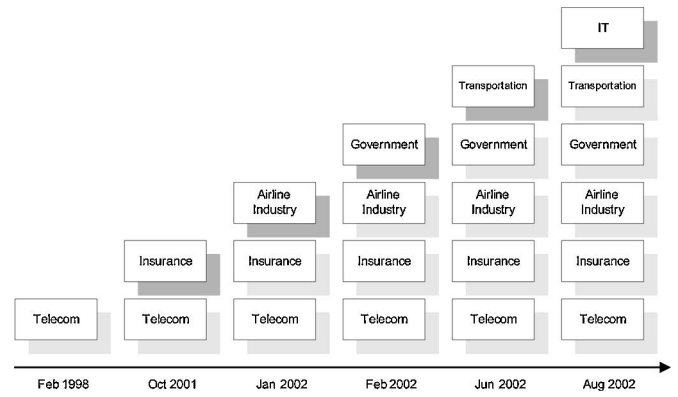


Fig. 1. TT&T’s market expansion plan.

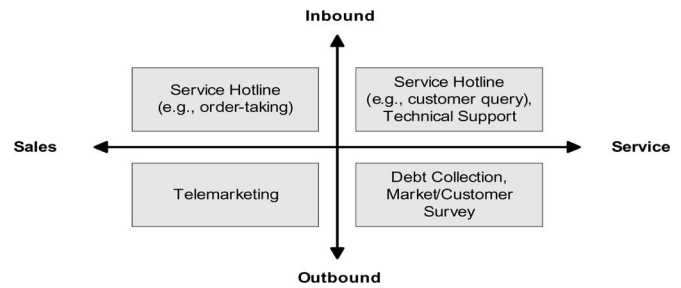


Fig. 2. Categories of TT&T’s service products.

TABLE III  
TT&T’S BUs AND THE TYPES OF INDUSTRIES AND CLIENTS SERVED

Business Unit	Industry	Major clients
BU1	Telecom (inbound service)	TCC
BU2	Telecom (inbound service)	TFN, TCC
BU3	Telecom (inbound service)	TAT
BU4	Business development	--
BU5	Automobile, airline, banking, IT, insurance, transportation (outbound service/sales)	Toyota, etc.

support), outbound sales (e.g., telemarketing), and outbound service (e.g., debt collection and market survey).

The majority of the company’s resources were allocated to inbound operations, which provided the organization with the primary source of revenue.

We put more emphasis on inbound projects since they generated major portions of our revenue. In such projects, we would ensure high quality service to satisfy our customers even though it would utilize additional resources. In some situations, the nature and size of our projects differed significantly which inevitably resulted in different levels of attention to service quality. For example, in outbound projects, we paid less attention and considered quality control as less important as compared to inbound projects. (Deputy Director of Development and Planning, April 27, 2004, TT&T#01.)

TT&T organized itself into five BUs (see Table III). While BU1, BU2, and BU3 focused on inbound operations, BU4 dealt with business development, and BU5 specialized in outbound operations.

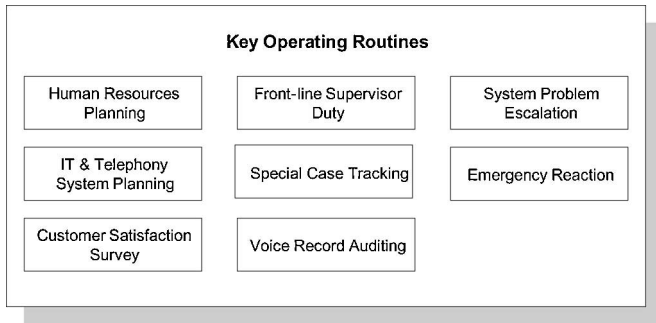


Fig. 3. Eight key operating routines identified in TT&T.

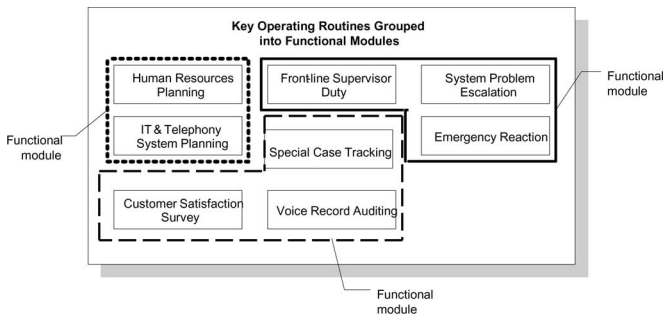


Fig. 4. TT&T's key functional modules.

1) *Key Functional Activities Within TT&T:* Facing increasing client demands and more sophisticated customer services, TT&T had to better integrate its existing client and product portfolios. With the need to diversify beyond the telecommunication industry to pursue other external opportunities, TT&T faced the challenges of rapidly seeking specific know-hows about new markets and producing alternative product configurations to attract and satisfy diversified clients. The organization was forced to reexamine its daily operational activities to assess how it could best configure its activities and serve its clients both effectively and efficiently. Eight major types of activities within its daily operation (i.e., operating routines) were identified by the senior management (refer to Fig. 3).

Basically, these activities represented the main functions of the call center operation in TT&T which included front-line management, resource planning and quality control activities that support the front-line operation. (Deputy Director of Development and Planning, April 27, 2004, TT&T#01.)

Even though these activities were important to TT&T's daily operation, not all were included in every single business project since the nature of each project might differ, especially with the diversified client portfolio. (Chief Consultant of Development and Planning, May 24, 2004, TT&T#11.)

The eight key operating routines were grouped according to separate functions that they were serving and these groupings were called "functional modules" (see Fig. 4).

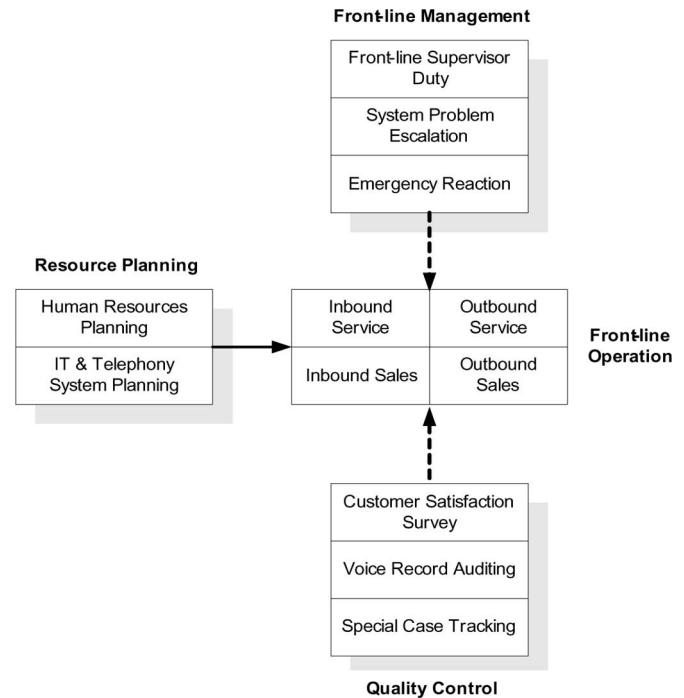


Fig. 5. Three major pillars of the call center operation at TT&T that support the front line operation and the respective operating routines involved in each pillar.

We reckoned that by grouping these key functional activities according to work functions that they were serving, we could plan and design the work activities in new projects more effectively and efficiently. (Director of Business Unit 1, June 1, 2004, TT&T#12.)

Fig. 4 shows that both "Human Resources Planning" and "IT & Telephony System Planning" routines are combined, and named as a "functional module" serving the "resource planning" function. Also, the "Customer Satisfaction Survey," "Voice Record Auditing," and "Special Case Tracking" routines served the "quality control" function that helped to monitor the level of service quality delivered to customers. In general, TT&T's daily operation involved three major "pillars": "resource planning," "front line management," and "quality control" that together support the front line operation. Fig. 5 shows the three major pillars of the call center operation at TT&T and the respective operating routines involved in each pillar.

Comprehensive documentation of the standard operating procedures for each department allowed the diffusion of knowledge within the organization. Furthermore, the successful integration of a myriad of systems and infrastructure to support TT&T's daily routine activities was also crucial to the organization's development of its capabilities. TT&T had to set up a complex telecommunications system infrastructure such as interactive voice response technology, computer telephony integration, automatic call distribution, and private branch exchange systems to optimize operational efficiency. The Systems Department also built on the infrastructure to create several customized applications to meet the needs of its clients from various industries.

*B. Phase 2: Focusing on Strategy Development  
(September 2002–June 2003)*

In this phase, TT&T focused its efforts on strategy development. The aforementioned three major pillars were key structures and functionalities for TT&T's diversified projects (see Fig. 5). These pillars were determined by the senior management and were identified by examining how these structures and functionalities had been supporting TT&T's past and present operations, and adapting continuously to changing client requirements. When asked how TT&T decided that the set of key structures and functionalities was viewed as an optimal solution, the Deputy Director of Development and Planning explained the following.

Through learning from past experiences and our improved knowledge of the market conditions, we identified the three pillars as the major modules for most (if not all) of our project activities. Our progress (e.g., increased market penetrations) so far could be a strong indication that our offerings were working very well. Nevertheless, we also acknowledged the need to constantly adjusting these key structures and functionalities whenever the need arises in this dynamic environment. (Deputy Director of Development and Planning, April 27, 2004, TT&T#01.)

To advance project completion, core modules from previous projects were often reused. For example, when a "welcome call" project was set up for a new client, suitable parts from similar projects were identified. The reuse allowed the complexity and cost in implementing new projects to be reduced, as only peripheral alterations were required to tailor the projects to suit client needs. A supervisor from BU5 described how she prepared a new project.

I used one of the 'welcome call' projects as my pre-defined format. All that was left for me to do was to customize the telephone scripts and reset the standard values of key performance index. (Supervisor from BU5, June 21, 2004, TT&T#22.)

*1) Resource Planning Function:* TT&T would formerly only recruit potential job seekers who possessed the appropriate abilities and personalities for typical service-oriented functions. Before starting work, new employees had to master basic customer service skills and any other industry-specific knowledge. The Director of BU1 estimated the following.

Customer service knowledge accounts for 80% of an agent's skill set while industrial knowledge comprises only 20%. (Director of BU1, June 1, 2004, TT&T#12.)

The senior management endeavored to promote multiple-skill training and interfunctional job rotations among staff. Generally, CSRs had to work in areas of their primary expertise and also served as backup for other hotlines where their secondary knowledge was relevant. The Senior Manager from BU2 commented as follows.

As a call center, our assets comprise our employees' skills and knowledge. Therefore, it is necessary to fully utilize these valuable assets. (Senior Manager from BU2, May 11, 2004, TT&T#07.)

Such arrangements enhanced TT&T's operational efficiency in terms of better arrangement of shift work. They also improved job satisfaction as the rate of attrition was reduced by 20% due to lower levels of job stress.

At TT&T, the Systems Department's major role involved developing application programs, which were used to facilitate project workflows. To aid the maintenance and development of information technology and telephony systems, TT&T constructed a flexible modular technological platform. The Deputy Director of the Systems Department explained the following.

A major benefit of the modular platform is that all applications (or programs) could easily be plugged in and out. Adjustments could be performed within a particular application with minimum modification to its interface with the platform. (Deputy Director of the Systems Department, June 8, 2004, TT&T#17.)

Furthermore, TT&T chose to retain its in-house Systems Department, which to its senior managers was crucial to the organization's operational performance. In-house design and coding had improved TT&T's response to client's requests from an average of 30–45 days to 15–20 days, depending on the complexity level of the requests.

*2) Front Line Management Function:* Front line management involved key customer service activities. Generally, front line procedures would vary across projects. However, there were some service modules that could fit into most sales situations such as "greeting the customers," "ending the call," and "after-call closures." Furthermore, TT&T had engaged an English institution that specialized in behavioral research to jointly develop a set of customer interaction techniques. In addition, several measures were used to evaluate CSRs' performances. These performance criteria included queuing time, response time (duration of a phone call), CSRs' engagement rate, and several others, and were recorded in real time. The assessment was fundamental to senior management facilitating better supervision and management. The General Manager of Customer Service commented the following.

After we implemented real-time assessment, the number of customer complaints reduced from 35 to less than 10 per month. (General Manager of Customer Service, June 7, 2004, TT&T#15.)

*3) Quality Control Function:* TT&T implemented several quality control measures that aimed to improve front line operation through the deployment of systematic analytical tools: customer satisfaction surveys, service quality audits, phone monitoring system, and case tracking procedures. The results were compiled as performance evaluation reports, where the performances of CSRs were evaluated and analyzed both quantitatively and qualitatively. The organization also put in place a



policy of investigating and analyzing issues that arose in daily operations. The Manager of BU1 explained the following.

We identify problems in the existing operations and trace the sources, based on prior experiences and performance evaluation reports. (Manager of BU1, May 18, 2004, TT&T#08.)

### *C. Phase 3: Institutionalizing the Strategy (June 2003 Onwards)*

Having identified and developed its key functions in the preceding phase, TT&T strengthened and centralized its operational processes by institutionalizing the strategic support functions. TT&T restructured its organization by creating a new BU. The Development and Planning Department became BU6, and its main task was to coordinate the operations of BU1, BU2, and BU3. TT&T also aimed to improve its operating routines by conducting several process improvement meetings. In its process improvement initiative, TT&T relied on the joint efforts of several departments to improve its processes. The Chief Consultant of Development and Planning commented the following.

The process improvement meeting is a weekly event, where related personnel would examine ongoing projects, and explore opportunities to improve the operations. (Chief Consultant of Development and Planning Department, May 10, 2004, TT&T#04.)

Existing processes were reexamined and new processes were implemented. Employees were motivated to continue improving their current work routine processes, and managers were open to discussing new ideas with their subordinates. This positive attitude toward continuous improvement can be owed largely to TT&T's attractive incentive scheme. For example, to encourage contribution of new ideas, each employee would obtain cash rewards of up to US\$ 200 for any positive idea he or she proposed. Furthermore, TT&T's senior management was committed to supporting an open learning environment, where the experiences of its employees were highly valued. Special multilevel meetings spanning various functional departments were conducted, where employees were encouraged to share their experiences and ideas. TT&T's middle management was encouraged to view the operations from a wider and more strategic perspective, and they served as spokespersons for their individual departments. Such sharing of information would result in the creation of new organizational knowledge based on tacit departmental experiential knowledge among managers during their discussions. Absorption of operation-level information would also ensure that the senior management had up-to-date information on issues relating to daily operations.

At TT&T, experimentation, prototyping, and system testing were mechanisms used iteratively to continuously improve operations and delivery of services. TT&T's strategy of reusing parts of existing processes during new process designs provided useful validation and offered new opportunities for improvement, as these routine processes were viewed as working prototypes for future projects. The fit between clients' requirements and the organization's delivery of customer service continued to

improve as the organization learned from each iterative use of its prototypes. Consequently, the need for alterations declined tremendously. For example, the General Manager of Customer Service commented the following.

The customer survey reports we obtain from customers allow us to reduce alteration work by 25%. (General Manager of Customer Service, June 7, 2004, TT&T#15.)

During system and process redesigns, employee feedback was important to developing optimal and new user-friendly organizational routines. TT&T applied the same capabilities to deliver different services to different industries, leveraging its expertise to deliver a wider range of services to the same client while serving different clients in similar industries.

## V. CONSEQUENCES: MAJOR TRANSFORMATION OF TT&T'S BUSINESS OPERATION

Overall, TT&T managed to transform itself from an in-house customer service department to a private call center serving clients from a wide range of industries. The entire business transformation was a great success: 1) TT&T's client base expanded from a single industry in 1998 to eight industries in 2003. The list of clients included major corporations such as Toyota, Microsoft, and many others. 2) In Taiwan, TT&T outpaced its rivals in terms of service quality and operational efficiency. Results from internal reports indicated that TT&T's market share in the Taiwan call center industry rose sharply from 2% to 38% within six years of operation. 3) TT&T had concrete overseas expansion plans. As its first step, TT&T boosted its brand name in the call center industry by publishing a book series to propagate its customer service concepts and best practices in call center operations. Fig. 6 depicts a timeline displaying major events (to illustrate the dynamism in call center's context) in TT&T's capability development process.

## VI. DISCUSSION: REVISITING THE FINDINGS IN LIGHT OF THE PROCESS OF MODULARIZATION

Based on the TT&T case study and the findings that emerged, we developed a process model of modularization, as depicted in Fig. 7.<sup>3</sup> As our model suggests, modularization is a complex process in which an organization's key functional activities are decomposed into specific operating and strategic routines<sup>4</sup> that are reconfigured iteratively during the process of capability development. Interestingly, it is noted that TT&T's capability development process is largely consistent with the three stages suggested by previous strategy literature: founding, development, and maturity [19]. For example, at the founding stage, TT&T preconditioned the emergence of capabilities and seek opportunities for revenue expansion. At the development

<sup>3</sup>In this paper, we refer to modularity of organizational routines and capabilities, and how they are achieved at the organizational level.

<sup>4</sup>In this study, we conceptualize organizational routine as falling into two types: operating routine, which accounts for the operational functions of a firm, and strategic routine, dedicated to the modification of operating routine, especially in a high-velocity market [53].

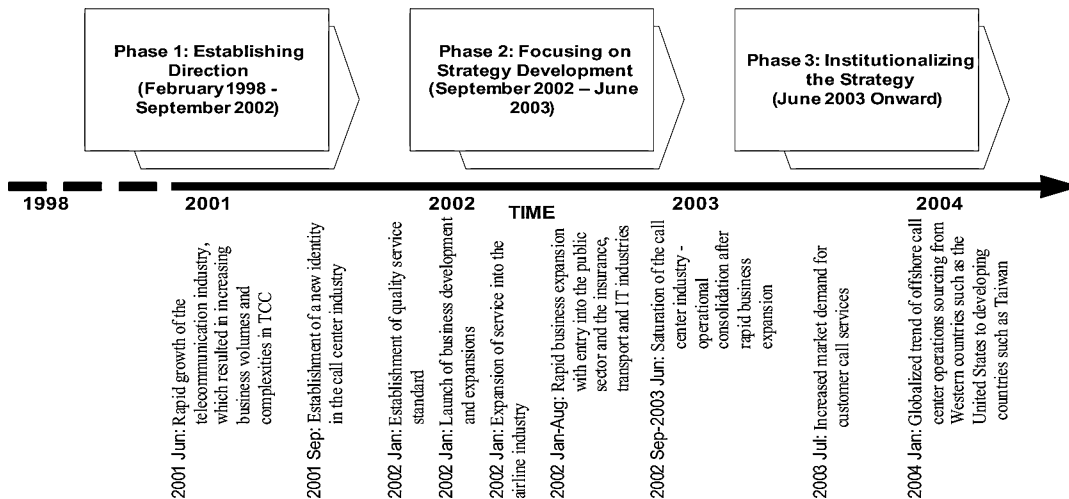


Fig. 6. Timeline displaying major events in TT&T's capability development process.

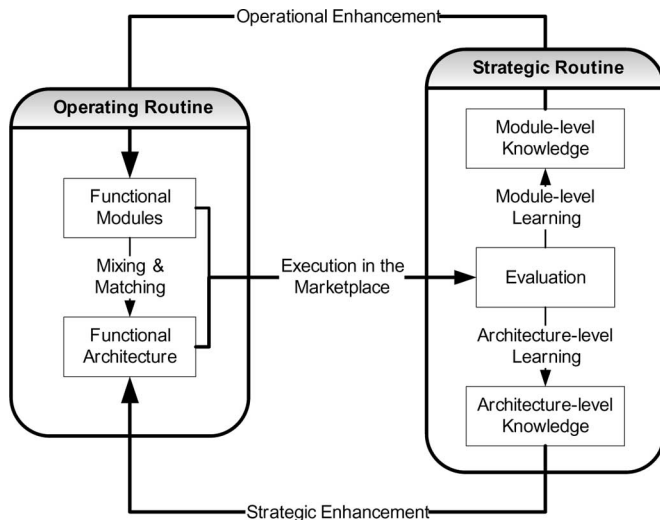


Fig. 7. Process model of modularization derived from the case of TT&T.

stage, the organization continuously adjusted and adapted to the environment, captured and exploited existing organizational knowledge, and provided training and incentives to enhance strategic planning, flexibility, and commitment. At the maturity stage, TT&T routinized its processes and leveraged the existing know-how. Also, the key resources used in TT&T's capability development process can be categorized as leadership, organization culture, technology, and long-term vision. Given that this model was inductively derived from the TT&T case study data, we present how the existing literature corroborates the model and how the model enriches our present understanding of modularization.

#### A. The Evolution of Operating Routines in the Process of Modularization

Fig. 7 suggests that the process begins with the identification of functional modules.

These modules were determined by the senior management and were identified by examining how they had been both sup-

porting TT&T's past and present operations, and continuously adapting to changing client requirements. Usually, in a complex system of organizational routines, the conceptualization of modules involves a process that is based on the identification of modules by segmenting the entire system [27]. A functional module is described as performing a specific function that suggests that the collective role of a group of organizational routines and each product, whether tangible or intangible, comprises functions that distinguish one product from another [36]. The eight operating routines identified (see Fig. 3) were grouped into three functional modules: resource planning, front line management, and quality control (see Fig. 5). The operating routines of "emergency reaction," "system problem escalation," and "front line supervisor duty" would be a good example of a functional module that performed a front line management function at TT&T.

Having identified the three functional modules, TT&T mixed and matched these modules and formulated functional architectures for individual business projects. These functional architectures can be viewed as TT&T's overall operating structures and functionalities [43] for carrying out each individual business project. A functional architecture is considered a design for the arrangement and interoperation of functional modules that together provide the overall functionalities delivered by a service product [46]. The mixing and matching of functional modules is important [21] since the process may help to formulate an "optimal functional architecture" that could respond to client demands in the most efficient manner [45]. Besides, as "one-form-fit-all" service often fails to meet diversified clients' needs, a fixed arrangement of resources and processes may prevent the organization from realizing the full benefits of modularity [27]. After all, modularity in organizational routines, as manifested in functional architectures, calls for different configurations of organizational resources that can generate new ways of developing organizational capabilities [36].

The selection decision was largely based on the organization's knowledge of its past project experiences. An example of a functional architecture in TT&T would be the amalgamation of the three functional modules: resource planning, front line management, and quality control that made up the key architectures for

the entire call center operation (see Fig. 5). Nevertheless, not all projects required all three functional modules. For example, the functional architectures for both inbound and outbound projects were different. In inbound projects whose main focus was to conduct sales order taking and answer customer queries, the functional module of “quality control” would take center stage. However, in outbound projects<sup>5</sup> whose focus was on conducting telemarketing and marketing surveys, “quality control” was included only partially in the project’s functional architecture. This is because, in some cases, projects might be smaller in scale and could compromise on the quality aspect of the surveys conducted. Given the project nature, the complete inclusion of the “quality control” module could become too costly and redundant. It is noted here that modules within functional architectures store transactive memory of an organization’s operation that may ease the coordination of various functional modules [10] and allow efficient resource management [36]. For instance, TT&T reused similar modules across a range of projects, which helped save significant time and switching cost [51] during the process of architecture building. The “welcome call” project was set up for a new client involving only peripheral alterations as duplicate parts from similar projects were used. Furthermore, TT&T also adopted standard interfaces to aid the reconfiguration process within or between modules. For example, in the maintenance and development of information technology and telephony systems, TT&T constructed a standard modular technological platform that allows all applications (or programs) to be plugged in and out easily. Adjustments could also be performed within a particular application with minimum modification to its interface with the platform.

### *B. The Evolution of Strategic Routines in the Process of Modularization*

The next phase suggests that the modularization process involves how functional modules and architectures evolve in response to feedback and stimuli from the external environment (i.e., business markets) through execution in the marketplace. This is inevitable since, in dynamic marketplaces, there are rarely any permanent and stable fits between business operations and their external environments [47]. To obtain superior performances, organizations ought to maintain a dynamic fit between the two entities [14]. To assess the fit, organizations need to conduct an evaluation process that aims to identify the degree to which the operating routines and the business environment are congruous [2]. Evaluation is useful as execution in the marketplace may lead to the identification of discrepancies or gaps [47]. Besides, organizations do learn from trial-and-error processes [4]. In the case of TT&T, the organization devoted continuous efforts to evaluating potential mismatches between its operating routines and the market expectations. The organization used both quantitative and qualitative methods to evaluate the outcomes of the execution of its operating architectures in business projects. For example, to assess whether customer service was well received among clients, a set of key performance

<sup>5</sup>Refer to Fig. 2 for the explanations of the nature of inbound and outbound projects.

indicators and a special case tracking and analysis facility were used within front line management.

Following the evaluation phase, our model indicates that learning occurs at two levels: “module” level and “architecture” level. Module-level knowledge focuses on alternative skills or technological advancements that help to turn functional modules into better performing modules within an existing functional architecture [37]. Examples in the case of TT&T that demonstrate learning at the module level include the knowledge gained by the workers in interfunctional job rotations that helped ease the process of arranging shift work since workers had mastered additional skills, and could therefore, handle more diversified jobs [35]. This could help improve “human resource planning” activities. Also, the Systems Department built on existing system infrastructure and developed several customized applications to suit the individual needs of the diversified portfolio of clients. Architecture-level knowledge concerns business environment changes in the long haul, which may result in a new functional architecture—new ways of module configuration [37]. For example, in the case, the need to serve customers beyond the telecommunications industry had forced the organization to reconfigure its functional architectures in accordance with the requirements of clients from various industries by attaching, detaching, and combining its various functional modules. In general, knowledge obtained at both architecture and module levels is crucial to renewal and development of organizational routines [11] especially since repeated practice and incremental learning from small mistakes would eventually lead to capabilities that are complex, difficult to imitate, and responsive to change [13]. Besides, it is crucial to study organizational learning mechanisms that relate organizational knowledge to capability development [53].

After obtaining new knowledge at module and architecture levels, our model suggests that the structures and functionalities of the operating routines would be renewed and reconfigured. Strategic routine represents the modification of operating routines through which firms achieve new resource configurations especially in volatile markets [13]. An example of how operating and strategic routines can be reconfigured in the case is through surfacing and resolving operational issues during weekly process improvement meetings. During the meetings, various heads of departments explored alternative process and resource configurations, and developed solutions to address the operational issues. Through operational enhancement, such feedback and discussions could lead to improvement at the operational level (infiltrated into operating routines) as module level knowledge was applied to refine functional modules of operating routines. For example, one improvement made as a result of the discussion was the speed of customer response. This was achieved by empowering front line staff to modify existing telephone scripts whenever the need arises since they are the ones who identify and manage mistakes during the real-time production and consumption of customer service [6]. Through strategic enhancement, the feedback and discussions could lead to process rationalization, before they are activated and routinized throughout the organization [1]. In this enhancement process, the architecture-level knowledge was applied to refine functional architectures

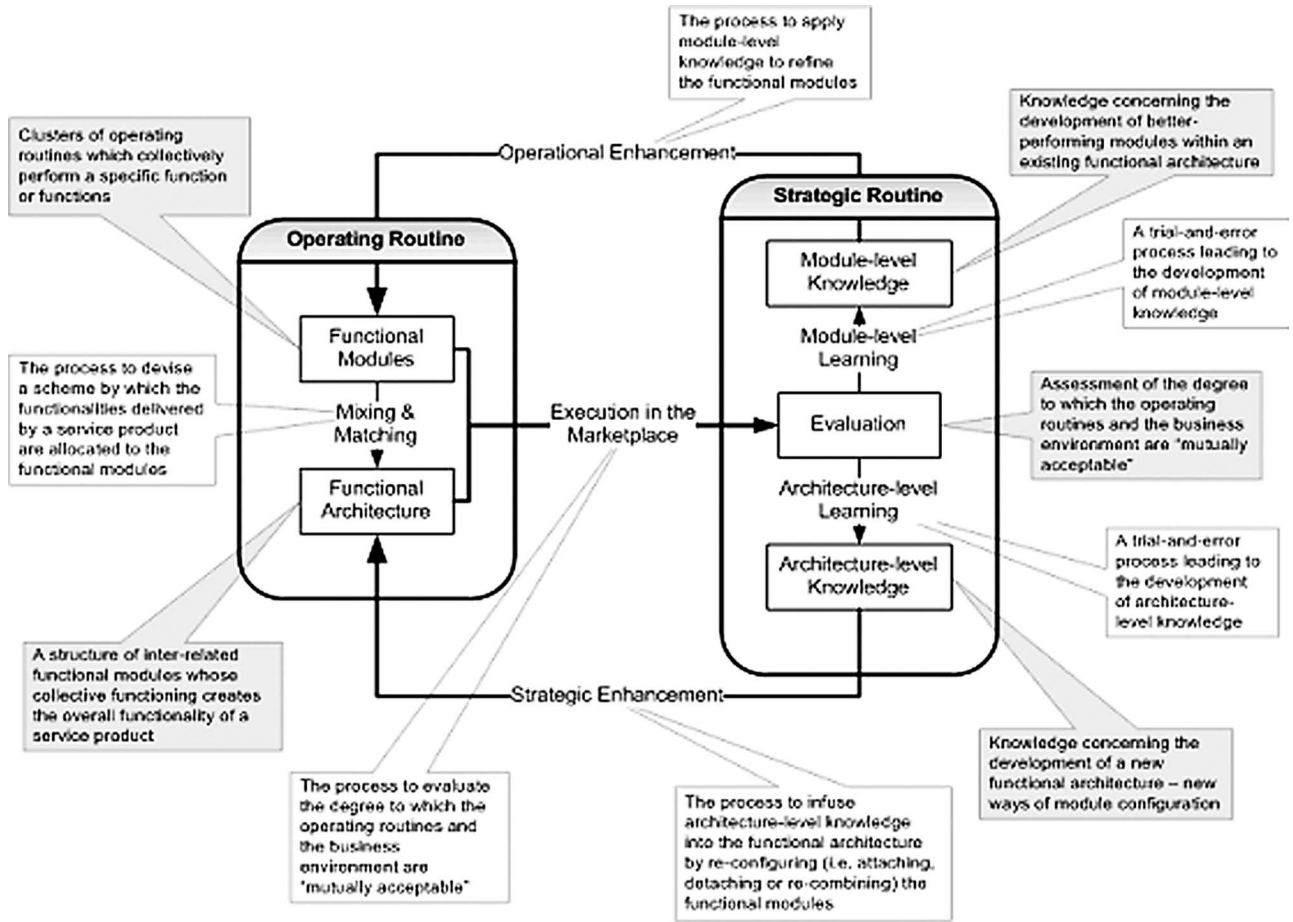


Fig. 8. Detailed explanation of the modularization process.

of operating routines. An example would be TT&T's success in strategizing and developing capabilities to deliver a wider range of services to the same client while serving different clients in similar industries.

Overall, the loose coupling relationship among various functional modules [21], [30], [37] made modularization possible and provided TT&T with flexibility and agility during capability development. By implementing and managing modularity of organizational routines, this has profound implications for the organizational process. It sets in place a system for continuous improvement of the routinized activities and leveraging the modular structures to exploit the "economics of substitution" [9]. Fig. 8 illustrates a clear explanation of the modularization process.

Table IV provides a summary of key concepts and their definitions adopted in the proposed model.

## VII. THEORETICAL AND MANAGERIAL IMPLICATIONS

The process model of modularization presented in this paper has significant implications for researchers and practitioners. While previous studies have suggested that successful introduction of modular systems requires fundamental technological and organizational reorientation [51], our model makes

TABLE IV  
SUMMARY OF KEY CONCEPTS AND THEIR DEFINITIONS ADOPTED IN THE PROPOSED MODEL

Concept	Definition
<b>Organizational Routine</b>	Organizational routine can be described as "a repetitive, recognizable pattern of interdependent actions, involving multiple actors" [15, p. 95].
<b>Functional Module</b>	A functional module is described as performing a specific function that suggests the collective role of a group of organizational routines and each product, whether tangible or intangible comprises functions that distinguish one product from another [36].
<b>Functional Architecture</b>	A functional architecture is considered a design for the arrangement and interoperation of functional modules that together provide the overall functionalities delivered by a service product [46].
<b>Evaluation</b>	An evaluation process which aims to identify the degree to which the operating routines and the business environment are congruous [2].
<b>Architecture-level knowledge</b>	Architecture-level knowledge concerns business environment changes in the long haul, which may result in a new functional architecture – new ways of module configuration [37].
<b>Module-level knowledge</b>	Module-level knowledge focuses on alternative skills or technological advancements which help to turn functional modules into better-performing modules within an existing functional architecture [37].

it clear that a patterned sequence of phases does take place during modularization. The model may serve as the basis for further investigation. For researchers, ours represents one of the first process models that describe and analyze how modularity of organizational routines are implemented and managed during capability development. While previous studies have established the proposition that modularity enhances flexibility of organizational systems in the face of dynamic market

conditions [24], [35], there is not a single process model that examines the modularization process. The paper contributes a novel process model of modularity and its interactions with capability development processes at the firm level. This is an important contribution toward the dynamic capabilities literature since issues on how firms could reduce their time in establishing a strategic direction or diffusing and growing a strategy rapidly through the firm has remained unaddressed till now [29]. Our process model of modularization could provide some answers in the area.

As the process model presented in this paper is grounded in the capability development path as revealed in the TT&T case, aspects of this model should generalize to other cases of capability development. However, more empirical work is necessary to test the applicability of the model in other settings. This is especially so since our investigation has focused on a developing country, and given the nature of market competition, we believe that in developed countries, firms may have to be even more flexible and innovative. Researchers could compare if there is vast difference in terms of modularization phases in the two settings. Further research could also study when specific resources will be most effective in implementing modularity of organizational routines. For example, whether resources are more likely to be transformed into routine modules during the early phase of capability development, or when the development and institutionalization of strategy have taken place. Finally, more research should also explore the degree of modularization influenced by environmental factors. Specifically, future research could explore how organizations may adjust their modularity implementation strategy according to their strategic positioning in a competitive market.

For practitioners, this study provides useful insights into how to manage modularity of organizational routines during capability development to achieve sustainable competence in fast-moving marketplaces. The TT&T case underscores the need for managers to adopt the concept of modularity as a strategic tool to enable and shape the development of organizational routine processes. The functional modules and architectures can serve as adaptable platforms for deploying variety and change during capability development. Furthermore, it is unlikely that managers will be constantly making vast changes to their operating and strategic routines; therefore, it is important for managers to gain some awareness of how these organizational routines may evolve.

### VIII. CONCLUSION

The purpose of our paper has been to outline a grounded process model of modularization during organizational capability development. By drawing on the case study of the capability development experience of a call center in Taiwan, we have developed a process model that depicts modularization as a complex process, whereby organization's key functional activities are decomposed into specific operating and strategic routines that are reconfigured iteratively during the process of capability development. Through interviews with relevant stakeholders and the

use of secondary data, we have identified key activities that form the mechanisms of the entire modularization process. We have done so by examining how the case organization reoriented its resources to meet market demands. The TT&T case has provided an opportunity to demonstrate how to implement and manage modularity of organizational routines during capability development. The findings of this study, however, should be viewed within the context of its limitations. First, we could not time the interviews to coincide with the decisions being made in the organization, and had to rely instead on the interviewees' retrospective view of the decisions. A disadvantage of retrospective responses is that they might be affected by errors of recall [17]. We have attempted to minimize errors of recall by having key informants who were either in the senior or middle management and had been personally involved in the capability development process. The second limitation concerns the generalizability of a single case study. Herriott and Firestone [20] suggest the preference of multiple-case study design over single-case study design for obtaining more compelling and robust data. However, we posit that "one must follow a more opportunistic approach even if that means settling for a single case study" [23, p. 447] especially where quality and in-depth data are difficult to obtain, as in this study. Besides, a single case is also useful in theory building [12]. Despite the limitations, we believe that our study has produced a very useful process model of modularization that offers a vocabulary for framing experiences and learning from the capability development process in terms of how resources can be developed and transformed. We believe that it is important for organizations to obtain a deeper understanding on how to embrace the modularity concept during capability development; such understanding would shorten the time an organization would need to establish a strategic direction and diffuse a strategy rapidly through its ranks.

### APPENDIX A

#### LIST OF INTERVIEWEES, JOB POSITIONS, INTERVIEW DATES, AND TRANSCRIPT NUMBERS

Ref.	Position	Department	Interview Date	Transcript Number
1	Deputy Director	Development & Planning	27-Apr-04	TT&T#01
2	Project Manager	Development & Planning	27-Apr-04	TT&T#02
3	Service Manager	Development & Planning	2-May-04	TT&T#03
4	Chief Consultant	Development & Planning	10-May-04	TT&T#04
5	Assistant Manager	Business Unit 1	11-May-04	TT&T#05
6	Assistant Manager	Business Unit 3	11-May-04	TT&T#06
7	Senior Manager	Business Unit 2	11-May-04	TT&T#07
8	Manager	Business Unit 1	18-May-04	TT&T#08
9	Deputy Director	Human Resource	18-May-04	TT&T#09
10	Deputy Director	Business Unit 2	18-May-04	TT&T#10
11	Chief Consultant	Development & Planning	24-May-04	TT&T#11
12	Director	Business Unit 1	1-Jun-04	TT&T#12
13	Manager	Business Unit 2	1-Jun-04	TT&T#13
14	Assistant Manager	Information Systems	1-Jun-04	TT&T#14
15	General Manager	Customer Service	7-Jun-04	TT&T#15
16	Deputy General Manager	Customer Service	8-Jun-04	TT&T#16
17	Deputy Director	Information Systems	8-Jun-04	TT&T#17
18	Director	Business Unit 4	8-Jun-04	TT&T#18
19	Customer Service Officer	Business Unit 1	21-Jun-04	TT&T#19
20	Manager	Business Unit 5	21-Jun-04	TT&T#20
21	Customer Service Officer	Business Unit 2	21-Jun-04	TT&T#21
22	Supervisor	Business Unit 5	21-Jun-04	TT&T#22

## APPENDIX B

### EXCERPTS OF INTERVIEW TOPIC GUIDE TT&T'S DEVELOPMENT PROCESS, OPERATIONS, AND RESOURCE INTEGRATION

- 1) What were TT&T's short-term or long-term plans? Why was this direction chosen? What adjustments were made to the organizational structure? How were existing resources deployed to support this? What were the changes in the prevailing management style? During the adjustment process, how were the employees convinced to change?
- 2) What was TT&T's competitive advantage? How was it developed? Were the competitive advantage and resources leveraged to guide TT&T to meet its milestones? Was the competitive advantage sustainable?
- 3) When handling outsourced customer service projects, how were processes, personnel deployment, and service packages formulated? How did the organization acquire related knowledge? Was technology leveraged? How did the organization win clients' trust?
- 4) What factors were taken into consideration when selecting front-end processing, service operation, and operational management systems? What were the challenges faced during system development? How was coordination with vendors and external clients achieved in terms of communication and the understanding of requirements and system compatibility?
- 5) When handling external business from different industries, what were the challenges faced when integrating various information systems? During process construction, how were problems resolved? After setting up the process, were there any records kept as reference for future process development? During process improvements, was there any resistance?
- 6) How was training conducted? How did TT&T manage to balance between specialization, standardization, and providing quality service? How did TT&T store and transfer any knowledge created during delivery of service, process modification, or system development?
- 7) How did you handle problems faced during the service process or delivery? Were these experiences used as part of future process development reference material?

### ACKNOWLEDGMENT

The authors are indebted to R. Sabherwal, the Department Editor, and two anonymous reviewers for their insightful comments and constructive feedbacks in the earlier versions of the paper.

### REFERENCES

- [1] M. Adria and S. D. Chowdhury, "Centralization as a design consideration for the management of call centers," *Inf. Manage.*, vol. 41, pp. 497–507, 2004.
- [2] C. Alexander, *Notes on the Synthesis of Form*. Cambridge, MA: Harvard Univ. Press, 1964.
- [3] R. Amit and P. Schoemaker, "Strategic assets and organizational rent," *Strategic Manage. J.*, vol. 14, pp. 33–46, 1993.
- [4] P. Attewell, "Technology diffusion and organizational learning: The case of business computing," *Org. Sci.*, vol. 3, no. 1, pp. 1–19, 1992.
- [5] J. B. Barney, "Firm resources and sustained competitive advantage," *J. Manage.*, vol. 17, pp. 99–120, 1991.
- [6] J. Bowen and R. C. Ford, "Managing service organizations: Does having a 'thing' make a difference?," *J. Manage.*, vol. 28, no. 3, pp. 447–469, 2002.
- [7] D. Buchanan, D. Boddy, and J. McCalman, "Getting in, getting on, getting out, and getting back," in *Doing Research in Organizations*, A. Bryman, Ed. London, U.K.: Routledge, 1994, pp. 53–67.
- [8] B. Cleveland and J. Minnucci, "Developing the e-enabled call center: A strategic perspective," *Bus. Commun. Rev.*, vol. 30, no. 6, pp. 44–50, Jun. 2000.
- [9] M. Cusumano and K. Nobeoka, *Thinking Beyond Lean*. New York: Free Press, 1998.
- [10] A. Edmondson, R. Bohmer, and G. Pisano, "Disrupted routines: Team learning and new technology implementation in hospitals," *Admin. Sci. Quart.*, vol. 46, pp. 685–716, 2001.
- [11] A. Edmondson and B. Moingeon, "When to learn how and when to learn why: Appropriate organizational learning processes as a source of competitive advantage," in *Organizational Learning and Competitive Advantage*, B. Moingeon and A. Edmondson, Eds. London, U.K.: Sage, 1996, pp. 17–37.
- [12] K. M. Eisenhardt, "Building theories from case study research," *Acad. Manage. Rev.*, vol. 14, pp. 532–550, 1989.
- [13] K. M. Eisenhardt and J. A. Martin, "Dynamic capabilities: What are they?," *Strategic Manage. J.*, vol. 21, pp. 1105–1121, 2000.
- [14] M. S. Feldman, "Organizational routines as a source of continuous change," *Org. Sci.*, vol. 11, pp. 661–629, 2000.
- [15] M. S. Feldman and B. T. Pentland, "Reconceptualizing organizational routines as a source of flexibility and change," *Admin. Sci. Quart.*, vol. 48, pp. 94–118, 2003.
- [16] B. G. Glaser and A. L. Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, IL: Aldine, 1967.
- [17] W. Glick, G. Huber, C. Miller, D. Doty, and K. Sutcliffe, "Studying changes in organizational design and effectiveness: Retrospective event histories and periodic assessments," *Org. Sci.*, vol. 1, pp. 293–312, 1990.
- [18] R. M. Grant, "The resource-based theory of competitive advantage: Implications for strategy formulation," *Calif. Manage. Rev.*, vol. 33, pp. 114–136, 1991.
- [19] C. E. Helfat and M. A. Peteraf, "The dynamic resource-based view: Capability lifecycles," *Strategic Manage. J.*, vol. 24, pp. 997–1010, 2003.
- [20] R. Herriott and W. Firestone, "Multisite qualitative policy research: Optimizing description and generalizability," *Educ. Res.*, vol. 12, pp. 14–19, 1983.
- [21] J. Huang, S. Newell, B. Galliers, and S. L. Pan, "Component-based development and the dynamics of organizational subcultures," *IEEE Trans. Eng. Manage.*, vol. 50, no. 1, pp. 88–99, Feb. 2003.
- [22] S. L. Jarvenpaa and B. Ives, "The global network organization of the future: Information management opportunities and challenges," *J. Manage. Inf. Syst.*, vol. 10, pp. 25–48, 1994.
- [23] S. L. Jarvenpaa and D. E. Leidner, "An information company in Mexico: Extending the RBV of the firm to a developing country context," *Inf. Syst. Res.*, vol. 9, pp. 342–361, 1998.
- [24] M. Keil, "Pulling the plug: Software project management and the problem of project escalation," *MIS Quart.*, vol. 19, pp. 421–447, 1995.
- [25] B. Kogut and E. H. Bowman, "Modularity and permeability as principles of design," in *Redesigning the Firm*, E. H. Bowman and B. M. Kogut, Eds. New York: Oxford Univ. Press, 1995, pp. 243–260.
- [26] A. Langley, "Strategies for theorizing from process data," *Acad. Manage. Rev.*, vol. 24, pp. 691–710, 1999.
- [27] W. Lannes and J. Logan, "A technique for assessing an organization's ability to change," *IEEE Trans. Eng. Manage.*, vol. 51, no. 4, pp. 483–488, Nov. 2004.
- [28] J. Mikkola and O. Gassmann, "Managing modularity of product architectures: Toward an integrated theory," *IEEE Trans. Eng. Manage.*, vol. 50, no. 2, pp. 204–218, May 2003.
- [29] M. Miles and A. Huberman, *Qualitative Data Analysis: A Sourcebook of New Methods*. Beverly Hills, CA: Sage, 1994.
- [30] I. Oshri and S. Newell, "Component sharing in complex products and systems: Challenges, solutions, and practical implications," *IEEE Trans. Eng. Manage.*, vol. 52, no. 4, pp. 509–521, 2005.
- [31] B. Pentland, "Building process theory with narrative: From description to explanation," *Acad. Manage. Rev.*, vol. 24, pp. 711–724, 1999.
- [32] A. Pettigrew, "The character and significance of strategy process research," *Strategic Manage. J.*, vol. 13, pp. 5–16, 1992.

- [33] C. K. Prahalad and G. Hamel, "The core competence of the corporation," *Harvard Bus. Rev.*, vol. 68, pp. 79–91, 1990.
- [34] D. Raff, "Superstores and the evolution of firm capabilities in American bookselling," *Strategic Manage. J.*, vol. 21, pp. 1043–1059, 2000.
- [35] R. Sabherwal and I. Becerra-Fernandez, "The effectiveness of alternative knowledge integration processes for three types of specific knowledge: Some insights from the NASA-Kennedy Space Center," *IEEE Trans. Eng. Manage.*, vol. 52, no. 3, pp. 301–315, Aug. 2005.
- [36] F. Salvador, C. Forza, and M. Rungtusanatham, "Modularity, product variety, production volume, and component sourcing: Theorizing beyond generic prescriptions," *J. Oper. Manage.*, vol. 20, pp. 549–575, 2002.
- [37] R. Sanchez, "Strategic flexibility in product competition," *Strategic Manage. J.*, vol. 16, pp. 135–159, 1995.
- [38] R. Sanchez, "Strategic product creation: Managing new interactions of technology, markets, and organizations," *Eur. Manage. J.*, vol. 14, pp. 121–138, 1996.
- [39] R. Sanchez and J. T. Mahoney, "Modularity, flexibility, and knowledge management in product and organization design," *Strategic Manage. J.*, vol. 17, pp. 63–76, 1996.
- [40] L. Santiago and T. Bifano, "Management of R&D projects under uncertainty: A multidimensional approach to managerial flexibility," *IEEE Trans. Eng. Manage.*, vol. 52, no. 2, pp. 269–280, May 2005.
- [41] C. Selland, "Offshore versus onshore contact centers," *Customer Relationship Manage.*, vol. 8, p. 24, 2004.
- [42] M. Shank, "Creating the modular organization," in *Adaptive Enterprise: Creating and Leading Sense-and-Respond Organizations*, S. H. Haechel, Ed. Boston, MA: Harvard Business School Press, 1999, pp. 207–224.
- [43] P. Taylor and P. Bain, "An assembly line in the head: Work and employee relations in the call center," *Ind. Relat. J.*, vol. 30, no. 2, pp. 101–117, 1999.
- [44] D. J. Teece, G. Pisano, and A. Shuen, "Dynamic capabilities and strategic management," *Strategic Manage. J.*, vol. 18, pp. 509–533, 1997.
- [45] D. Tranfield and S. Smith, "The strategic regeneration of manufacturing by changing routines," *Int. J. Oper. Prod. Manage.*, vol. 18, pp. 114–129, 1998.
- [46] S. Z. Tseng, *Exploring the Pyramid of Call Center—Operational Processes of Call Centers*. Taipei, Taiwan: Pearson Education Taiwan, 2003.
- [47] S. Tully, "The modular corporation," *Fortune*, vol. 127, pp. 106–112, 1993.
- [48] K. Ulrich, "The role of product architecture in the manufacturing firm," *Res. Policy*, vol. 24, pp. 419–440, 1995.
- [49] H. Volberda, "Toward the flexible form: How to remain vital in hypercompetitive environments," *Org. Sci.*, vol. 7, pp. 359–374, 1996.
- [50] M. Wade and J. Hulland, "Review: The resource-based view and information systems research: Review, extension, and suggestions for future research," *MIS Quart.*, vol. 26, pp. 107–142, 2004.
- [51] E. Webb, R. Campbell, D. Schwartz, and L. Sechrest, *Unobtrusive Measures: Nonreactive Research in the Social Sciences*. Chicago, IL: Rand McNally, 1966.
- [52] S. G. Winter, "Understanding dynamic capabilities," *Strategic Manage. J.*, vol. 24, pp. 991–995, 2003.
- [53] N. Worren, K. Moore, and P. Cardona, "Modularity, strategic flexibility, and firm performance: A study of the home appliance industry," *Strategic Manage. J.*, vol. 23, pp. 1123–1140, 2002.

**Shan L. Pan** received the Ph.D. degree in management information systems from the University of Warwick, Coventry, U.K., in 2000.

He is currently in the Department of Information Systems, School of Computing, National University of Singapore (NUS), Singapore. His research work has been published in the *Management Information Systems Quarterly Executive (MISQE)*, the IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT (TEM), the *Journal of the American Society for Information Science and Technology (JASIST)*, the IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE (TITB), the *European Journal of Operational Research (EJOR)*, the *Communications of ACM (CACM)*, the *Information and Organization (I&O)*, the *Journal of Strategic Information Systems (JSIS)*, and the *European Journal of Information Systems (EJIS)*. He is on the editorial boards of the *Communications of AIS*, the *Information and Management*, and the *European Journal of Information*.

**Gary Pan** received the BBA degree from National University of Singapore, Singapore, in 1997, and the Ph.D. degree in management information systems from the University of Manchester, Manchester, U.K., in 2004.

He is currently a Practice Assistant Professor in the School of Accountancy, Singapore Management University, Singapore. His current research interests include the areas of information systems (IS) project management and accounting information systems. His articles have appeared in the *Management Information Systems Quarterly Executive (MISQE)*, the IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT (TEM), the *European Journal of Operational Research (EJOR)*, the *Journal of American Society Information Science and Technology (JASIST)*, the *Decision Support Systems (DSS)*, the *Information Systems Journal (ISJ)*, the *Journal of Strategic Information Systems (JSIS)*, the *Communications of the AIS (CAIS)*, and the *International Journal of Information Management (IJIM)*.

**Adela J. W. Chen** received the Master's degree from the School of Computing, National University of Singapore, Singapore, in 2006. She is currently working toward the Ph.D. degree at the Department of Management Information Systems, Terry College of Business, University of Georgia, Athens.

Her current research interests include the organizational and strategic issues of adopting and managing information systems in complex changing environments.

**Ming H. Hsieh** received the Ph.D. degree in international business and marketing from Warwick Business School, University of Warwick, Coventry, U.K., in 2002.

She is currently an Associate Professor in the Department of International Business, National Taiwan University, Taipei, Taiwan. She was a Research Director, and conducted several market research projects for major multinationals. Her current research interests include topics in cross-national research, brand management, and customer relationship management (CRM). Her papers have been published in the *Journal of the Academy of Marketing Science*, the *Journal of International Marketing*, the *Journal of Product and Brand Management*, and the *Journal of Organizational Computing and Electronic Commerce*.