

Rigid flexibility framework (RFF) in the operations strategy paradigm: An exploratory study of its applications in service industries.

**Abstract**

This article explores the connection between the rigid flexibility framework (RFF) with the overall operations strategy paradigm in the context of the service industry. The model was originally developed to explain factors that determine flexibility in a manufacturing environment. Collins and Schmenner (1993) introduced it and recently, da Silveira (2005) reexamined it and provided some empirical validation. The model prescribes procedures and practices leading to simplicity and discipline to help organization attain flexibility in operations. Regardless of the operations competitive priorities, the RFF framework could help service organizations to achieve flexibility in operations. Learning from the four Malaysian cases in this study, it is suggested that the RFF has operations strategy elements with an emphasis on quality programs and lean production initiatives.

**1. Introduction**

With the ever-changing nature of a global business operation that requires firms to adjust rapidly, operations flexibility has become more influencing, underpinning the competitive strength of an organization. This is also evident as the academic community has given attention to this subject. The concluded 2007 Production Operations Management Society's (POMS) conference in Dallas listed few articles in managing flexibility such as the ones written by Stevenson and Spring (2007), concerning supply chain, and Kareem (2007), on operation strategy. If that remains the case about the importance of flexibility in manufacturing, what could be said of a service setting where the product is less tangible, cannot be stored, and changes are more volatile? Experts agree that flexibility could be used to enhance business performance (Swamidass and Newell 1987; Fiegenbaum and Karani 1991; Narashimhan and Dass 1999).

The application of various flexibility models (originated from the manufacturing literature) to services is promising. Many principles in operations management cascade well in its application to service organizations. TQM, JIT and Lean system application in service industries have a strong presence in the literature. Schroeder (2007) emphasize the intertwined nature of manufacturing and services and attribute the success of Wal-Mart, Nordstrom, Starbucks, Amazon.com, and FedEx, to the brilliant application of operations management concepts such as service design, quality improvement, and lean operations, just to name a few, in their service business.

One such promising model to help service organizations achieve flexibility in operations, but surprisingly still under-research is the rigid flexibility model proposed by Collins and Schmenner (1993). Their study focuses on manufacturing strategies and their responsiveness to the market's requirements, through simplified processes and discipline in procedures. Recently, Slack (2005) highlighted the emerging importance of IT and other organizational sources the so-called '*infrastructural*' flexibility. This article explores the potential of applying the principles of the rigid flexibility model to service industry through a case study approach. By doing so, we hope to expand the knowledge in operations by (1) discussing the rigid flexibility model in the context of service operations and, (2) providing initial insights into applying this model to service organization by looking at several successful service companies as case studies.

## **2. Background**

Operations flexibility is very much related to changing the structure and infrastructures of the organizations. The categorizations of the resources into structure and infrastructures have been controversially debated. Schroeder (2007) followed the definitions given by Hayes and Wheelwright(1984), suggesting structure resources include capacities, facilities, process technology, and vertical integration whereas infrastructures include people, information system, organization, production and inventory control, and quality control system.

The rigid flexibility model emerged from the idea of “complementarily” in manufacturing strategy, as opposed to the trade-off view of prioritizing competitive criteria (Collin et al, 1998). Rather than imposing a specific sequence of priorities, the model recommends policies, programs, practices and procedures on how to be responsive to the market. Collins et al. (1990) found that the variables used in the inventory management realm– warehousing, product cycle times, and total cycle times in manufacturing are strongly supported by simplicity dimensions. The authors also determined that product cycle time depends on the idea of lean attitude, management systems, and process capability. Finally, they also found that strategic and quality management have a great influence in achieving flexibility. Their findings also support that new products development are strongly dependent on simplicity and discipline. The research also suggests that higher levels of simplicity and higher levels of discipline lead to higher degrees of flexibility in manufacturing operations.

From a manufacturing perspective, simplicity is about the firms’ initiative to streamline information and simplify material flow processes. Simplicity puts together all the processes involved, for instance, the product concept development and design, the manufacturing processes, and the distribution processes to reach customers or end-users. Discipline, on the other hand, is about the implementations of steady and dedicated procedures in regards to the processes. This would result from improvements or changes made in several areas such as planning, technology used, labor development, scheduling, changes in product design, and control processes to respond to changes in environment. Examples of discipline are standardization of procedures, deployment of adequate employee training, preventative machine maintenance, and implementation of inventory and warehouse management system.

Surprisingly, the only replication of the study was done by Da Silveira (2005). He uses a broader international database, includes a technology and organization programs dimension and found a moderating role of the dedicated line layout in the relationship between simplicity, discipline, and flexibility. Da Silveira (2005) found that companies frequently implement simplicity and discipline programs concurrently with the achievement of flexibility. This suggests that simplicity programs appear to have a positive relationship with flexibility and it is significant in three out of four flexibility dimensions used by Da Silveira’s (2006) study. The same result is true for

*discipline* where the author found discipline programs to be positively related to the flexibility dimension.

In order to apply this model to service industries, adjustments need to be made as the original model is designed for manufacturing industries. Thus, the use of factors such as inventory management and warehousing (Collins et al, 1998) may not be as relevant to the analysis of service organizations given their lesser role in service environments. In general, the programs and initiatives proposed by Collin and Schmenner (1993) and, Da Silveira (2006) are policies (integrated programs, procedures and practices) to support operation objectives (such as flexibility) under Schroeder's (2007) operations strategy framework. The main policies in Schroeder's framework are related to decisions on process, quality, capacity and inventory. These policies are applicable to the service industries except for inventory as in services the product has to be consumed simultaneously to production. Therefore, following this model, this set of policies should be designed to achieve simplicity and discipline. For example, to achieve simplicity, Collin and Schmenner (1993) suggested that organizations use kanban-related practices, problem solving activities, supplier lead time control, and supplier relations whereas to attain discipline they proposed the implementation of process capability, quality vision, business process documentation, defects controlling, manufacturing strategy, performance measurement, scrap and rework control, and training. Similar policies, practices and procedures are proposed by Da Silveira (2006): simplicity could be accomplished by implementing pull production, E-commerce/e-business, IT/ERP, non-core activities outsourcing, new product development, speed, and process focus/re-layout; while discipline can be achieved by having specific programs for process equipment updating, quality initiatives, environment and safety, and equipment productivity/TPM.

Looking at the elements of simplicity and discipline programs in the model as depicted in Table 1, it is observable that the programs have operations strategy elements with an emphasis on quality programs and lean production initiatives. It is also consistent that most elements to achieve simplicity have strong foundations in lean systems while most elements to achieve discipline have a strong base on quality management programs and maintenance management. We can also argue that the simplicity program based on the principles of lean systems will require major

adjustments to the structural and infrastructural resources of the service firms but, will have good and long effects in improving the structural and strategic flexibility through improving the service design. The discipline dimension, on the contrary, as it only involves infrastructural changes will mostly influence the operations oriented strategies for routines.

Using those principles in service organization is nothing new and it had been studied previously. Thus in proposing the strategy and programs, in accordance to the rigid flexibility framework, to achieve (1)simplicity in a service setting, we propose that a service organization should be (a) relying cleverly on technology/IT (b) standardizing the system and equipment (c) relaxing the organizational structure and,(d) simplifying the operations process, in tandem with the lean system principle. This argument will be developed further at the later section of the paper.

As to achieve discipline, a service organization should strive for (a) consistent organizational culture (such as a quality culture) (b) staff development through training (c) having competitive performance measures in place (d) using a standardized quality documentation; all have the characteristics of total quality management program.

Thus, at this juncture, we define the rigid flexibility model theoretically as an operations strategy based on the principle of lean systems, quality management programs and maintenance management in order to achieve service operations flexibility through simplifying the process and disciplining the system.

Table 1: Elements of the rigid flexibility models and common themes in OM

Elements discussed in the rigid flexibility model  (C: Collin et al,1993; DS: Da Selveira, 2005)	Themes in OM
Manufacturing strategy(C)	Operations strategy
Kanban practices(C), controlling supplier lead time (C), and supplier relation(C), E-commerce/e-business(DS), IT/ERP (DS), Non-core outsourcing (DS), NPD speed(DS), and process focus/re-layout(DS)	Lean system
Problem solving activities(C), the implementation of process capability(C), quality vision(C), business process documentation(C), defects controlling(C), performance measurement(C), scrap and rework(C), training(C)	Quality management programs
Process equipment updating(DS), environment and safety(DS), and equipment productivity/TPM.(DS)	Maintenance management

### 3. Method

We use a case study method as we view that the rigid flexibility model, its elements and its application to the service sector have not been studied as yet. In addition, the model's relation to the broader framework of operations strategy has also not been investigated in the literature. In this section, we hope to investigate the real practical examples of 'flexible' organizations and relate their policies, programs, procedures

and practices in executing operations strategy to become flexible and relate them to the elements of the model itself and to a broader service flexibility framework. Thus, our unit of analysis is the whole organization.

Where theory is being developed, this approach is suitable (Eisenhardt, 1991) as it is about getting into the details and richer pictures. The selection of the case companies is based on their reputation as excellent companies, especially the one that assumes and prides itself to be a flexible organization. Eisenhardt (1991) recommended four to ten cases; with less than four the ability to find details is lessened and with more than ten cases one runs the risk of detail saturation.

We now move to analyze practical examples from the real organizations. The companies will be identified as Companies A, B, C, and D. The first case is a low-cost airline. It has been selected because of its reputation as the best low cost airline in Asia. Second in the list is the case of a port management company with the reputation as a 'flexi-port'. The port just won an award as the best world port for its IT initiatives. Next, a four star hotel is selected and finally, a logistics service provider that has won several quality awards.

The general question to be asked in the interview sessions is their views on service operations flexibility; its importance and how to achieve it in the context of their business. We prepared a set of open-ended questions to guide the discussion, depicted in Appendix A. We don't restrict ourselves to follow the framework of the rigid flexibility model, although it is perfectly fine to have some preliminary framework in mind in the process of building theory (Wacker, 2004) A total of 22 employees at the executive and managerial level were interviewed. This is specified in Table 2. When necessary, we made a follow-up call to the informants to ascertain the obtained information.

Business strategy of Company A promotes value by giving low-cost air travel to customers, thus stressing less the aspect of being flexible to customer needs. In fact, during the interview, one of the managers pointed out that flexibility is the sign of weakness in his business, and he prefers the word 'adaptability' instead. This market segment has been educated to adhere to policies and procedures set by the company. For example, the paid in advanced ticket will be very difficult to be refunded

something that the customers know very well. The company brilliantly controlled the needs in (variability and uncertainty) in lieu of being efficient. Being able to control most uncertainty, some capacity is reserved for those customers who happen to need higher levels of flexibility. Those who want to change the ticket and the date of travel will have to pay a penalty for that flexibility of being more. As a result, the company is able to generate more revenue through yield management techniques. Thus, the company cleverly manipulates the remaining variation and end up making more revenue from it.

Company B is the one who champion to be a real flexible company. For this reason, the company is building more capacity by expanding the port and investing in IT/technology. The IT manager showed us a parcel of land for further expansion. Also, we posed a question to the CEO of what he meant by being flexible and as expected the answer was “to be able to fulfill the requirement of the clients. The company has won award for its IT initiatives. The company also knows the importance of its people by investing in human resources. The company claims that its productivity records include moving 452 containers an hour with eight cranes, the best in the industry. It is the best employer of the year with comprehensive remuneration package for all level of employees. Relating to the model, it has almost all the characteristics of simplifying the process and disciplining the procedures.

The third company, Company C, has built some level of flexibility in its operations. It really strives hard to be flexible, mostly, by manipulating its workforce. The operations related strategies adopted emphasizes being flexible. It has a good training program with an emphasis on quality. Senior Duty Manager noted that hotels have to keep up with the rapid technological change. In particular, the online booking system through their website was critical in generating more revenue to the hotel besides the traditional practices of hotel room booking. The Bar & Restaurant Manager noted, “I adopt a job rotation for my staff, for instance every staff has to take turns to be a cashier too. Basically, they are holding two responsibilities with them, to be a waiter and a cashier or waiter to be a bar tender. We are looking into work flexibility and to train staff to become multi-skilled.

Table 2 Company Characteristics and Interview History

Organizations	Company A	Company B	Company C	Company D
Reasons for selection	Malaysian Promising Global Brand, Best Asia Airline 2007	Claimed to be flexible port  Winning Best IT efforts in World port conference 2007	Surviving competition with operations flexibility  Keep making profit while business is not good	Handling a massive logistics operations in 2 months period  Keep making profit while business is not good
Industry Sectors	Airline	Port Management	Hotel	Logistics
Staff Interviewed	Operations Manager, Technical Manager, Technical Staff	CEO  IT Managers  Operations Manager	Duty Manager  Bar and Restaurant Manager,  Several operations staff	Regional Director, Operation Managers, Operation staff
Total employees interviewed	3	3	7	5

The fourth company (D) is a logistic service provider is facing a challenge to financially and logistically organize a massive 30,000 Muslim people annual pilgrimage to Saudi Arabia. And E-Commerce is one important factor that the company pays particular attention to. In its operations, the E-Commerce services are offered to customers for deposit savings by using the services of third party company; the company offers local banks to become strategic partners where their customers can make deposits into accounts by using the banks' services, for instance, the banks' counter services, cash deposit machines, or by using internet banking. The company also emphasizes TQM as quality becomes a significant factor to both delivery time flexibility and volume flexibility. The level of flexibility to the customers is given depending on the products and services offered.

#### **4. Discussion of the Findings**

All companies have a well-built reputation in their respective service sectors with all companies having been operating for more than five years, keeping making profits and having business activities in other parts of the world. All companies have a clear direction in relation to the relationship between capability and flexibility.

First of all, they need to be flexible (business strategy) and work on plans to develop capabilities to be flexible. This is the case of Company B where they continue to build up capacity by expanding the port facilities and investing in technology/IT. For Company A, they are not competing on flexibility, what they do is controlling the needs (controlling the amount of changes they have to deal with) and use their capability for routines with the aim to attain values (low cost) to customers. They do manipulate the pricing (yield management) to get more revenue from those who want some level of flexibility. Thus, the design of Company A system and process is standard, much of their strategies are related to operations. Hence, both Company A and Company B are considered successful because they know their business and develop their strategy and capability accordingly.

The third company, a beach resort, is maintaining flexibility through its workforce (infrastructural), not much on the structural resources. The fourth company is a logistic provider, both use design and operating related strategies to attain flexibility, but depending on product and services offered.

With regard to the rigid flexibility model, it is observable that the program has operations strategy elements with an emphasis on quality programs and lean production initiatives. It is also consistent that most elements to achieve simplicity have strong foundations on lean system while most elements to achieve discipline have a strong base on quality management programs and maintenance management. We can also argue that the simplicity program based on the principles of lean systems will require major adjustments to the structural and infrastructural resources of the service firms but, they will have good and long lasting effects in improving the structural and strategic flexibility through improving the service design. The discipline dimension, on the contrary, as it only involves infrastructural changes will mostly influence the operations oriented strategies for routines.

The companies in this study, whenever appropriate, use standard equipment to ensure its easy maintenance and training of staff. The use of IT at the companies helps them plan for the unplanned changes they will possibly have to respond to. The clever use of IT has enabled the control filter, as specified by Correa and Gianesi (1994) to function properly. Furthermore, all companies have locked a partnership with its IT vendors for mutual benefit where they can constantly improve their system while the IT vendor learns to create innovative products according to customer requirements.

By utilizing IT, these companies have managed to simplify its operations. For example, Company A simplifies the delivery of food and beverages to the passenger through a limited choice of snacks and beverages. Finally, all companies have a simplified organizational structure that helps its management to communicate quickly with those at a lower level.

Training and development help them achieve the element of discipline. It is associated with labor flexibility in a manufacturing context. Performance measurement is used to monitor the standard to be achieved. For example, Company A uses such efficiency indicators as the 25 minutes turnaround of an aircraft, 85 percent on-time arrival and departure, etc. Company B uses their own standard of cargo loading to observe consistence in operations, and they continue to upgrade and improve their performance. This practice is similar to Collin and Schmenner's (1993) proposed use of ISO standards to achieve discipline. In addition, the total quality culture adopted by the company provides discipline for managing its operations.

Drawing from the conclusion of the cases analysis, we propose;

**Proposition 1:**

To achieve (1) simplicity in a service setting, a service organization should be (a) relying cleverly on technology/IT (b) standardizing the system and equipment (c) relaxing the organizational structure (d) and simplifying the operations process, in tandem with the lean system principle.

**Proposition 2:**

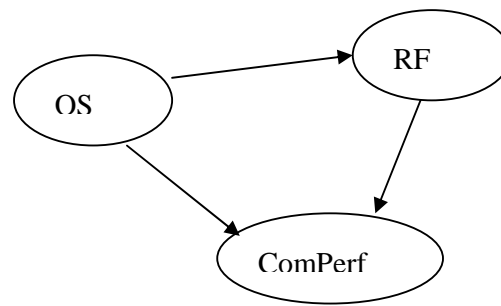
As to achieve discipline, a service organization should strive for (a) consistent organizational culture(such as quality culture) (b) staff development through training (c) having competitive performance measures in place (d) using a standardized quality documentation; all have the characteristics of total quality management program.

**Proposition 3:**

Since the simplicity and discipline elements were strongly present in these four companies regardless of their competitive priorities, and the elements of RFF are also directly influenced by the operations strategy, we suggest that RFF factors could be the 'middle' factor in affecting company performance. In summarizing the integrated model shown in Figure 2, we propose;

RF components are the mediating factor that affects the competitive performance of service companies.

. As this is an exploratory study, the observations made cannot be generalized, but offer interesting insights on the application of the model. We hope that these observations will trigger more research of service operations flexibility, particularly in the specific area of service design.



OS : Operations strategy  
 RF : Rigid flexibility components: simplicity  
 and discipline  
 ComPerf: Competitive performance

Figure 2: Proposing rigid flexibility model with the RF as the mediating factor

## 5. Summary

This study extends the border of the operations paradigm by including the elements of RFM which consist of simplicity and discipline. We have proposed that the two dimensions in the rigid flexibility model fit in the operation strategy paradigm, for both the manufacturing and the services sectors. It is suggested that the framework has operations strategy elements with an emphasis on quality programs and lean production initiatives. To achieve simplicity, companies should have strong foundations in lean systems while most elements to achieve discipline have a strong base on quality management programs and maintenance management. It is also argued that the simplicity program based on the principles of lean systems will require major adjustments to the structural and infrastructural resources of the service firms but, will have good and long lasting effects in improving the structural and strategic flexibility through improving the service design. The discipline dimension, on the contrary, as its only involves infrastructural changes will mostly influence the operations oriented strategies for routines.

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## APPENDIX A

### LISTS OF OPEN-ENDED QUESTIONS

- 1) Nature of the industry competition
- 2) Your business strategy, business model, customers
- 3) Your strengths
- 4) The importance of flexibility in your operations
- 5) The infrastructure that you require to support your operations
- 6) Your investments in infrastructural; people, technology, system
- 7) IT strategy
- 8) Quality management initiatives, efforts, investment
- 9) View of lean principles.
- 10) Special operation competencies (distinctive competencies)
- 11) Problems, challenges, future plans.