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Simulation of Port Disruption and Transportation Resources for U.S. Containerized Imports

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ABSTRACT

This paper investigates the feasible paths before and during port disruptions on the West Coast of the United States using discrete-event simulation. A discrete-event simulation application experiments with different regulations, disruptions, and infrastructure changes to show future dynamics by investment and planning events for operational decisions. The simulation conducts partially and fully disrupted scenarios comparing to the current operations. The output from the simulation highlights the significance of the impact from a long -term disruption, while the short-term disruption in the supply chain would need resilience with a quick response time to allow the system to recover. The long-term disruption scenario recommendation is to immediately

divert the flow to the neighboring infrastructure, which has similar and excess capacity. The short-term disruption scenario requires a decision-making process based on the diversion time and cost, and the search process required for finding the neighboring ports and landside resources that are capable to handle the extra freights. Thus, the partially disrupted scenario does not recommend diverting to other neighboring infrastructure. Supply chain planners will benefit from the study as it contributes to finding alternative solutions and diversified strategies for the U.S. container markets through fully developed intermodal services.

Keywords: Port disruption, Container, Simulation, Transportation, Security

INTRODUCTION

Since the first journey of container cargoes in 1956 in the United States, the growth rate of containerization has been boosted by growing international trade, changing polices, and emerging technologies. The average growth rate of the U.S. waterborne container trade by weight was approximately 7.35% for seven consecutive years (2002-2008), while the growth rate of the overall U.S. waterborne trade for all categories was 2.44 % until U.S. economic recession forced a reduction in the growth rate in 2008. The containerized cargoes have been transported through the railroad and interstate highway networks that are connected to seaports and massive container ports have been built along the deep coastlines to accommodate even larger container vessels (Panayides, 2006).

The transportation infrastructure in the United States for intermodal transportation systems is quite vulnerable; issues exist in security and safety as well as capacity of infrastructure and social or environments issues in port cities (NSTPRSC, 2007; Global Insights, 2007). For example, protection from terrorism is one of the greatest concerns for homeland security personnel (U.S. Department of Homeland Security, 2007). Terrorists might smuggle weapons of mass destruction (WMD), such as chemical materials, bio-hazardous materials, and nuclear weapons via container shipping. Thus, the containers destined for U.S. seaports are screened, inspected, monitored, and traced in accordance with the Maritime Transportation Security Act (MTSA) of 2001 and the Container Security Initiatives (CSI) of 2002 with the collaboration of 58 foreign container ports as of 2010. The logistician's security concerns are met with another challenge: screening all the containers shipped through U.S. ports without retarding the logistics flow. For example, 17 million containers were shipped through 70 container ports in 2008 in the United States (U.S. Department of Transportation, 2010). Logistics and security must be closely linked in order to maintain a safe and efficient flow of containers.

In addition to the security of the freight flow, most studies focus on the integration and expansion of the transportation infrastructure in the United States. In the meantime, the ports of Vancouver and Prince Rupert on Canada's west coast, the ports of Halifax and Montreal on Canada's east coast, and the Lazaro Cardenas port on Mexico's west coast promote their ports to attract shippers and carriers; these ports also look for customers to increase utilization of their facilities (Global Insights, 2007; Maloni and Paul, 2013). The Port of Vancouver in Canada expands its markets and serves the U.S. market as well as the Canadian market. Recently, the Port of Prince Rupert increased

its capacity to accommodate the Super Post-Panamax container vessels and expects to handle 2 million twenty foot equivalent units (TEUs) each year. The port has dedicated rail access to serve the U.S. and Canadian markets. The Port of Lazaro Cardenas will have 1,481-meter (4,887-foot) berth and 18-meter (59-foot) channel depth to accommodate four ultra large container vessels. The Kansas City Southern Railway Company (KCS) connects the port to the United States via four-railway border crossing. The Mexican Ports of Manzanillo and Lazaro Cardenas can utilize the 70% of their capacity to serve the U.S. markets (Leachman, 2010). The rails from these two ports transport direct shipments of container boxes by the Union Pacific Railroad Company (UP) and KCS to the U.S. customs terminals in Kansas City, Missouri.

Examining the port market concentration in the United States, about 55% of the international containers were concentrated on the West Coast in 2008. The Pacific ports show fast growth in line with the growth of the trans-Pacific trade. The port of Los Angeles handled 8.35 million TEU containers, and the port of Long Beach handled 7.3 million TEU containers in 2008 (American Association of Port Authority, 2011).

Both congestion and capacity limitations in handling containers challenge new infrastructure development in port areas of container terminals and hinterland transportation (Wan et al., 2013). The number of container vessel calls increased to 3,058, which is equivalent to 13.8 million TEUs at Los Angeles and Long Beach in 2008, while the utilization of the ports was approximately 77% with regard to the vessel calls by the total traded containers of approximately 10 million TEUs for both ports in California (see Figure 1). As the vessel size increases, the ports' infrastructure needs to increase for unloading capacity and container stacking in line with the hinterland transportation. Figure 1(a) shows the high number of container vessel calls at the

ports of Los Angeles, Long Beach, and New York. The ports of Los Angeles and Long Beach can handle 14,000 TEU vessels; New York City shows the number of vessel calls but relatively fewer TEUs, since the port of New York could handle 4,000 TEU vessels as of 2008.

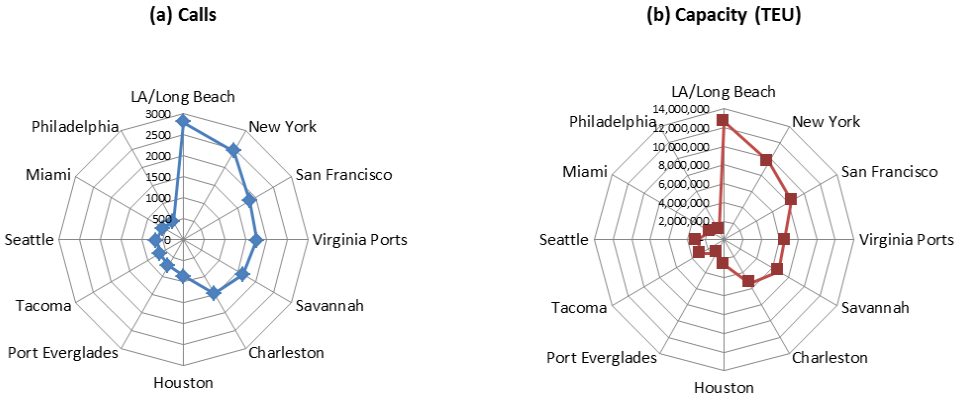


Figure 1. Capacity of Vessel Calls (a) and TEUs (b) at 12 Major Ports in the United States in 2008 (U.S. Department of Transportation, 2011).

The port of San Francisco presents a number of vessel calls but less capacity due to the depth of the port. The port of San Francisco could handle 8,000 TEU vessels in 3.5 days of mean processing time per vessel; meanwhile the port of Savannah, Georgia, shows relatively more constant situations for the vessel calls and capacity than any other ports. Savannah could handle a maximum loaded ship size of 4,000 TEUs and three days of mean processing time per vessel. The differences between San Francisco and Savannah are the maximum loaded ship size and the average processing time of vessels. The average container vessel size per call at the U.S. ports increased from 3,235 TEUs in 2004 to 3,744 TEUs in 2008 (a 15.7% increase) and increased by 13.1% to 5,603

deadweight tonnage (DWT) in 2008 (U.S. Department of Transportation, 2011).

This paper investigates the feasible paths before and during port disruptions on the West Coast of the United States using discrete-event simulation. A discrete-event simulation application, ProModel®, experiments with different regulations, disruptions, and infrastructure changes to show future dynamics by investment and planning events for operational decisions. Experiments with diversion scenarios are conducted by the hypothesized demand shift, such as diversion path from south Asia to the eastern United States (Global Insights, 2007); through significant infrastructure investment in Mexico; and through disruption in ports of Los Angeles and Long Beach (NSTPRSC , 2007; NISAC, 2009). The simulation conducts partially and fully disrupted scenarios comparing to the current operations. The results of the experiments would provide portfolio and alternative strategies for the supply chain planning in North America focusing on the U.S. containerized freight markets. In addition to the Canadian landbridge railroad system that serves U.S. markets, this study conducts a simulation of the scenario that the Mexican ports in the Pacific region would be considered as an alternative paths for the Mississippi River Valley and the lower Great Plains in the United States. Finally, supply chain planners will benefit from the study as it contributes to finding alternative solutions and diversified strategies for the U.S. container markets through fully developed intermodal services.

LITERATURE REVIEW

Simulation studies for intermodal transportation focus on terminal operations for mode change, port opertations, ocean shipping, or railroad operations (Dalal & Jensen, 2001). Hawker

et al. (2007) used GIS simulations for intermodal transportation networks to evaluate environmental policy. The study used detailed environmental parameters for converting them to cost impedance in the spatial network module to simulate the environmental impacts of the transportation networks.

Ernesto and Rivero (2004) used discrete-event simulation for distributing routes of a cross-docking sytem combining GIS to animate the vehicle's route selection and to calculate distances and delivery costs. Kraenzle (2006) used ArcGIS to monitor shipping containers for security purpose. The simulation model estimated the locations within an hour of travel time, and then updated the real position of objects integrated with global positioning systems (GPS) and radio frequency identification devices (RFID) in the real-time database on a display.

Chang (2008) introduced multiple objectives in a decomposition model to select the best routes for international intermodal networks. In the multiple objectives, the author minimized the total flow cost and the total travel time from origin to destination. Demand delivery time is one of the concerns that influences the responsiveness of the model, thereby weighting multiple objectives.

Supply chain during and after disruptions was simulated by Martagan et al. (2009) and Rensburg et al. (2005). Similar efforts for analytical models are simulated by Zhuang and Mier (2007) and Sheffi (2001). The SIERRA model (NISAC, 2009) provides a global network-based discrete-event simulation of ARENA®. This simulation model runs upon the origin-destination (O-D) matrices, estimated by Levin et al. (2009a; 2009b).

Discrete-event simulation provides realistic modeling for logistics systems recommending alternative solutions in multi-echelon supply chain (Vorst et al., 2000) and logistics planning of a container terminal considering maritime and landside

transportation (Lee et al., 2003). Due to the nature of the complexity of the global supply chain, little research has found a simulation model for the large-scale of global supply chain networks. The discrete-event simulation requires an abstract process to find alternative solutions in response to the supply chain disruptions.

RESEARCH METHOD

Vessels and port facilities should have security preparedness drills and plans for specific emergency scenarios in order to ensure successful implementation of the plans and appropriate response and recovery process (Bragdon, 2008). This study focuses on the possibility of trip diversion for the unexpected disruption in the North American transportation systems for imported container to the United States. The simulation model incorporates both maritime and railroad shipping together, since in many cases agents represent both marine vessels and railroad systems with fixed routine routes. In addition to the reasons, the highway system would be much less vulnerable than the rail system and marine terminals in terms of the economic significance and impact of a disruption, owing it to a number of alternative routes that are available using the highway system.

For these reasons, this model only focuses on port facilities that accommodate international container vessels, excluding mobile offshore drilling units based on the definition of the Safety of Life at Sea (SOLAS) regulation enacted in 1974. The agents that were generated in an optimization model were presented and graphically represented in GIS. Geographically several traffic lanes show significance, in which some segments are considered to be choke points and vulnerable areas.

Terrorism and natural disasters, such as tsunamis, storms, and earthquakes, will also affect freight flow through U.S. transportation infrastructure. Animating these sources of disruption represents the uncertainty through alternative channels in the integrated transportation systems. Any critical logistics nodes, such as marine ports and rail facilities, have a chance to be exposed to natural, as well as man-made disasters.

The growth of containerized freights changes the strategic alliances and system integration of the transportation activities for smooth operations in supply chain systems. This simulation integrates the maritime transportation and railroad operations for the containerized freights imported to the U.S. markets.

Components and Rules

Transportation systems consist of facilities, roads, carriers, commodities, and regulations for the operations. This simulation mimics real operations and behavior for imported containers to the U.S. in a discrete-event simulation model (Figure 2). For suppliers, the model selects the two major countries from the 156 foreign trade partners of the United States: China and South Korea. The two major partners export containerized freights to the United States, shipped to the west coast of Canada, the United States, and Mexico. The ports of Prince Rupert and Vancouver serve the container service from Canada to the U.S. market for Asian trade partners. On the U.S. West Coast, the ports of Seattle and Tacoma, Washington, the port of Portland, Oregon, the Ports of Oakland, Los Angeles, Long Beach, and San Diego, California were used in this study. In Mexico, the ports of Manzanillo and Lazaro Cardenas were chosen as alternative ports since the two ports have an alliance with UP and KCS, respectively. The Port of Lazaro Cardenas is a part of the smart port system with KCS.

The simulation models four types of facilities: foreign ports, the North American ports, marine-rail terminals for supporting landside transportation, and inland rail-truck terminals in the supply chain. The foreign ports are connected in virtual networks to the capital cities in China and South Korea in order to link freight sources.

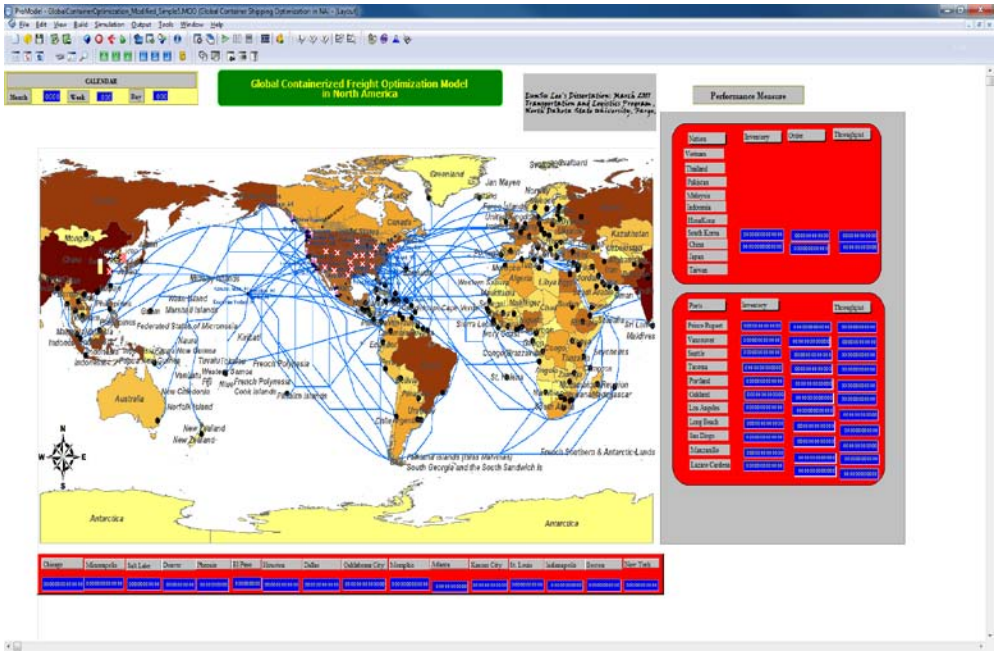


Figure 2. Screen Capture of the International Container Flow to the U.S. Markets.

The major ports in North America operate multiple terminals to accommodate container vessels and handle containers. The terminals have entity-based capacities in lieu of the gantry crane for unloading and water draft that affects vessel

sizes. In this model, the number of terminals for each port was determined based on Fan's (2010) thesis.

Marine-rail terminals serve imported containerized activities. Even if railroad companies separately operate the rail terminals near marine ports, the simulation assumes only one railroad terminal based on O-D information of the STB Public Use Waybill. For example, the simulation assumes one railroad terminal near the ports of Seattle and Tacoma, and one railroad terminal for the ports of Los Angeles and Long Beach. However, the rail terminal accommodates multiple railroad operators. The marine-rail terminal in the Seattle-Tacoma region, for example, can call railroad operations of the BNSF Railway Company (BNSF) and the Union Pacific Railroad Company (UP).

For the inland rail-truck terminals, the major container destination in the STB Public Use Waybill sample was selected for the experimental cities: Chicago, Kansas City (Missouri), Memphis, Minneapolis, Oklahoma City, St. Louis, Phoenix, Denver, Salt Lake, El Paso, Dallas, Houston, New York, Boston, and Atlanta. Since this model excludes the trucking industry, the model assumes that the major railroad terminals are the final destination for the container flow.

For ordering processes, the model consistently uses a 20-foot equivalent unit (TEU) as the unit for placing an order. Even if shippers and freight forwarders replace the international standard organization (ISO) containers with the maximum domestic containers such as a 53-foot box, the model still used the TEU box for consistency from an optimization perspective. The foreign partners in China and South Korea receive the orders based on the estimated O-D trip information (Lee, 2011; Lee et al., 2011).

The majority of agents for this model, which refer to as resources in the simulation, are container vessels and locomotives.

Furthermore, there are several other resources to handle containers in the supply chain systems, such as gantry cranes, rail cars, operators, barges, etc. In order to reduce complexity for modeling, the study only uses two major types of carriers.

The container vessels have a variety of capacities based on the vessel size: Handy, Sub-Panamax, Panamax, Post-Panamax, and Super Post-Panamax can handle approximately 1,000; 2,000; 4,000; 6,000; and over 8,000 TEUs, respectively. The study simulates Panamax, Post-Panamax, and Super Post-Panamax with respect to the demand size and distance from China and South Korea.

Locomotives haul the loaded and empty rail cars for containers. Instead of using rail cars as resources in the simulation study, the model uses locomotives for hauling the TEU containers between marine-rail terminals and rail-truck terminals. The locomotives are dispatched from the designated parking locations and nodes to the rail paths. Then, the locomotives head for the terminals to pick up the containers unloaded from the container vessels. Locomotives are operated by BNSF, UP, the Canadian Pacific Railway (CP), the Canadian National Railway (CN), and KCS in the model.

For paths, the model represents an intermodal transportation of marine and rail combination. Thus, the model generates two paths for the carriers: one marine shipping path for container vessels moving between the foreign trade partners' ports and another for the North American ports. The feasible routes were exported from GIS, and then imported in ProModel® as a background image. The path measures a distance in miles instead of nautical miles, where one international nautical mile is converted into 1.15077 miles. The mile unit gives a better understanding of the rail miles when combining of both miles and nautical miles.

Locomotives move along the rail path networks. The rail path represents the main lanes between ports and the inland major cities. In the model, the lanes are bidirectional and do not represent the interline bottlenecks. The locomotives also share the lines in the model since the model assumes that some lines would be connected to the other major lanes in a manner of alliance and collaboration. For example, the container from the port of Los Angeles to the New York intermodal terminal will be connected by UP and the CSX Corporation (CSX) at Memphis; however, the containers are transported by UP in the model (see intermodal core network at http://www.csx.com).

Data collection procedure

The O-D matrix was selected from the optimized O-D pairs for the import containers to the United States. Since this model selects the trade partners of China and South Korea utilizing the container terminals along the Pacific Coast of North America, the model simulates multi-echelon networks among foreign partners, marine ports, marine-rail terminals, and truck-rail terminals.
Some trips destined for the North American ports are distributed by rail to the inland markets and by truck to the portal areas without rail service. Thus, the portion of the rail shipping was estimated for the study. The portion of the rail shipping from the marine ports was calculated based on the O-D matrix for the maritime shipping and the outbound information from the selected ports by rail (Table 1).

The estimated ratio for the rail shipping is different from the Leachman et al. (2005) reports since this model estimated optimal O-D paths based on the system optimization (Table 2). However, this model's estimation is based on the STB Public Use Waybill sample zones, BEA zone aggregation. The average ratio of the rail shipping in BEA 160, for example, is around 79.5%. The

ratio of the rail shipping for the import containers varies year by year and port by port, so this study adopts the ratio from the system optimization implemented herein.

For simplicity, the simulation adopts the distribution ratio of destination from marine-rail terminals to the inland rail-truck terminals based on the BEA zones shown in Table 3. For instance, the ratio of the distribution from the marine-rail terminals at Los Angeles and Long Beach (in BEA160) equally distributed to Chicago (in BEA064) by 40% of the overall distribution from the origin BEA160.

Table 1. Origin-Destination Matrix for Rail Freight Transport

Origin	Destination	Outbound	Inbound	Ratio	Leachman (2005)
San Diego, CA	BEA161	45,327	45,327	1.00	0.7
San Diego, CA	BEA160	2,551,490	2,551,490	1.00	0.7
Los Angeles, CA	BEA160	2,381,433	4,055,818	0.59	
Oakland, CA	BEA163	194,026	796,906	0.24	0.7
Tacoma, WA	BEA170	245,910	648,947	0.38	0.7
Seattle, WA	BEA170	664,472	664,472	1.00	
Vancouver, WA	BEA182	604,541	619,175	0.98	n/a
Prince Rupert, WA	BEA182	103,821	103,821	1.00	

Table 2. Origin-Destination Matrix for Maritime Freight Transport

Origin	Destination	Flow (TEUs)
China	Long Beach, CA	2,551,490
China	Los Angeles, CA	2,606,216
China	Oakland, CA	796,906
China	Tacoma, WA	648,947
China	Seattle, WA	205,405
China	Vancouver, BC	619,175
Republic of Korea	Seattle, WA	459,066
Republic of Korea	Prince Rupert, BC	103,821

Container vessels are categorized into Panamax, Post-Panamax, and Super Post-Panamax, which can load 4,000; 6,000; and 12,000 TEUs, respectively. This study assumes that all ports can accommodate any vessel size, and vessel capacity is fixed in this model. In other words, the vessels wait in the port until they are fully loaded. The model does not allow the shortage of vessels to meet the demand, so the maximum number of vessels was dispatched in the model. However, the container batch arrival at a port triggers the arrival of the vessels in the discrete-event model. Thus, in the final performance report, the number of vessel calls and utilization of the vessels are measured.

Table 3. Distribution Ratio between Marine-Rail Terminals and Inland Rail Terminals

	BEA (Destination)												
Origin	040	064	073	096	099	107	127	131	152	160	163	167	Total
BEA160	0.02	0.40	0.18	0.04	0.06	0.00	0.17	0.11	0.01	0.00	0.00	0.00	1.00
BEA163	0.00	0.44	0.16	0.04	0.02	0.00	0.00	0.12	0.19	0.01	0.00	0.02	1.00
BEA167	0.01	0.53	0.25	0.04	0.07	0.00	0.06	0.01	0.00	0.03	0.00	0.00	1.00
BEA170	0.00	0.81	0.02	0.02	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.00	1.00
BEA182	0.00	0.63	0.32	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Total	0.02	0.49	0.16	0.03	0.05	0.03	0.13	0.08	0.01	0.00	0.00	0.00	1.00

Rail shipping uses the resources of locomotives categorized into BNSF, UP, CP, CN, and KCS railway companies. BNSF was dispatched to Seattle-Tacoma (SeaTac), Los Angeles-Long Beach, Portland, and Oakland; BNSF parked at major cities in the Midwest region, as well as New York and Boston. The locomotives of UP were dispatched and parked at Seattle-Tacoma, Los Angeles-Long Beach, Portland, Oakland, and San Diego. UP was

also dispatched to the port of Manzanilo in Mexico and served the markets of Phoenix, El Paso, Dallas and Houston. CP was only dispatched to the port of Vancouver, but parked at Chicago, Memphis, St. Louis, and Dallas as well. CN served the port of Prince Rupert and the inland U.S. markets of Chicago, Memphis, St. Louis, Kansas City (Missouri), and Dallas. The KCS locomotives were dispatched to the port of Lazaro Cardenas and the markets in Chicago, St. Louis, Memphis, Oklahoma City, Dallas, and Houston. Even if the locomotives were set for the parking and working places, they are triggered by the demand based on the probability of the O-D pair between marine-rail terminals and rail-truck terminals. Intermodal Association of North America (2011) reports that 87.57% of the rail intermodal activity is related to containers and other activity is related to trailers. Approximately 54.1% of the containers activities are international containers. Therefore, a train hauls 120 rail cars with 1.79 boxes on each car, and one box presents 1.7 TEUs (Levin et al., 2009a). Thus, 365 TEUs are loaded on a train. By doing this, one assumes that a single train hauls approximately 172 TEUs for a trip. The base 120 cars are subject to change due to geographical constraints, such as tunnels in West Virginia and Mexico or mountains from the port of Prince Rupert.

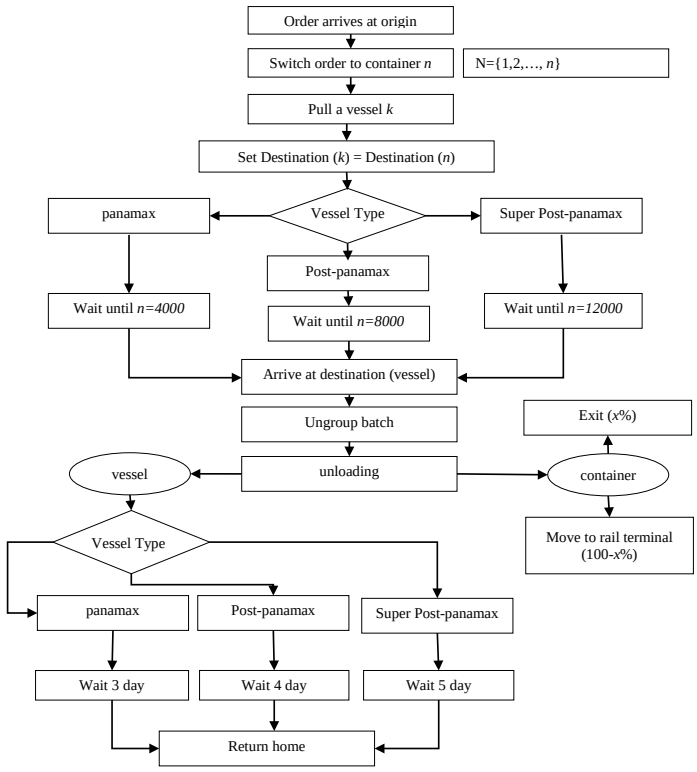
The North American ports have multiple terminals in order to accommodate the container ships. A summary reported by Fan (2010) provided the number and capacity of the terminals. The loading and unloading time for a Panamax vessel takes approximately three days, while the loading and unloading time for the Super Post-Panamax vessel takes about five days. The unloading and loading times were averaged by vessel size (also see Figure 3):

If a vessel size is equal to a panamax then wait: three days

If a vessel size is equal to a post panamax then wait:

four days
If a vessel size is equal to a super post panamax then wait: five days

Figure 3. Entity Flow Diagram of Containers and Vessels from Foreign Trade Partners.



In the simulation, the commodity consists of three main entities: container order, container, and batch (see Figure 3). The orders are generated in the arrival module, and then the orders are replaced by a container that is destined for the foreign trade

partner's ports. When a container arrives at the foreign trade partner's port, the container calls a vessel and groups the containers into a batch based on the vessel size. For example, if a container calls a Panamax, the vessel waits until it has 4,000 containers and carries them as one container batch. The container batch is ungrouped at the North American ports and unloaded to the container yards. During the unloading process, the vessel is under port service for a time window based on the average unloading processing time at a berth.

Disruption Scenarios

Due to the uncertainty of the security system in the global supply chain, researchers developed several scenarios based on the probability and damage severity of the disruptions. Severe disruption at a marine port would cause a trip diversion for carriers and shippers concerned with the inventory and opportunity cost caused by the inspection and congestion delay. With respect to the global supply chain, the disruption should be analysed with the detailed diversion plans implemented before a crisis and operations verified during a recovery period. As mentioned earlier, total impedance determines the trip decision, including the additional transportation, demurrage, and inventory impedance. The agents' behaviour varies depending on the scenarios and impact of the damage. This study develops three scenarios in terms of transportation mode and facility.

Scenario I is the base line scenario to represent the normal situation in order to compare to the other scenarios. The Port of Long Beach has two terminals: the first terminal operates three berths and the second terminal operates 15 berths. The average process time at the terminal one is five days to handle a Super Post-Panamax and the other is three days to handle a Post-

Panamax and a Panamax. In this scenario, the two Mexican ports of Manzanillo and Lazaro Cardenas do not serve the U.S. market.

Scenario II is called the partial disruption scenario by incidents. Since the model assumes that one of the two terminals at the Port of Long Beach must shut down, all the container vessels in a queue drift back onto the ocean for unloading the containers for the next two months during the recovery period. Assumption of the scenario is that the neighboring ports are busy, so they cannot serve the vessels from the Port of Long Beach. The model simulates the longer waiting time at the berths and an average waiting time of eight hours. As in the base scenario, the ports in Mexico do not serve the U.S. market since the containers remain at Long Beach and are not transferred to the other ports.

Scenario III of the full disruption at the port of Long Beach means that no vessels and containers can wait during the recovery time. Scenario III assumes that the other neighboring ports accommodate the freight vessels during the recovery period, so the vessels bound for the port of Long Beach divert to the ports in Mexico during the recovery process for three months. The critiques focus on the capacities of the ports and the rail-highway infrastructure, such as operations and double stacking constraints. However, this scenario assumes that the operation and capacity are similar to the ports in the United States and Canada. In the simulation, this study assumes that the travelling speed on the rail tracks in Mexico is 75% of the general intermodal speed in the United States (Association of American Railroad, 2011). This is the situation (3) shown in Figure 3, which moves to an alternative port for shipping.

Verification and Validation

For the purpose of verification and validation, researchers developed the display panel on the screen on a dashboard and

verified the system by checking orders and throughput at port and terminals (Figure 2).

- Total orders from the cities are the same as the total orders received from the foreign trade partners.
- The total orders the foreign trade partners receive are the same as the sum of inventory at the foreign ports and the throughput the ports handle.
- Total demands from the inland terminals are the same as the throughput through the inland terminals and the number of entities moving in the system.

To validate this model, the model used the number of trips from South Korea to the Port of Seattle. The system placed an order of 4,199 container batches. Among these orders, 3,749 orders exited from the system. Other 319 batches lingered in the system. Table 4 summarizes the average difference between the system parameter and the output results from 30 runs.

Table 4. Throughput at the Final Destinations

Destination	Average Throughput	Ratio	Test Run by 30 Replications	Difference
Chicago	1,757.41	0.82	0.822	0
Minneapolis	252.07	0.12	0.118	0.003
Memphis	41.55	0.02	0.195	0.005
Kansas City	42.66	0.02	0.020	0
St. Louis	43.48	0.02	0.198	0.002
Total	2,137.17	1.0	1.0	

In addition to the ratio of the average throughput at the final destinations, the validation also checks the number of orders comparing with the number of throughput and the number of average entities in the system. The difference is an error from the

warm-up period and run time since after a five-month warm-up period the system reaches a steady state:

Orders = Throughput + Entities in System + Error
2434.71 = 2137.17 + 298.23 – 0.69

Average time an entity stayed in system was 801 hours or 33.3 days. This is reasonable since an order has an average waiting time of two days, an average of four days at foreign trade partner's port, 12 moving days in ocean, four days at Seattle port, and seven days by rail shipping, and 2.5 days of pickup and deposit time for rail in general. Average time in move logic was 384 hours, 16 days including ocean and rail shipping. These lead times through the supply chain, there remains the variability of waiting time, travel time, and pick-up and deposit time.

Model Calibration

After running test replications, the model sets up the vessel assignment process for China and South Korea separately. Due to the significant demand in China, the Super Post-Panamax was assigned more frequently in China than in South Korea. ProModel® provides a function for generating random numbers between zero and the specified number. At the initial stage, the vessel assignment used random number generator by RAND (95) for two countries; however, the random number used for the simulation was RAND (90) for South Korea by decreasing the chance of using Post-Panamax vessels. Thus random numbers were assigned for Panamax within a range of 1 and 53, Post-Panamax within 54 and 80, and Super Post-Panamax within 80 and 90 (11%) for South Korea and within 80-95 (15%) for China.

This study assumes that the unloading time for a Panamax is three days, so the maximum number of vessel calls is 120

container vessels for a berth per day. A Panamax transports 4,000 TEUs, but the model assumes 120 TEUs is one container batch in terms of system performance. In other words, each berth for Panamax handles 4,000 container batches for a day. If the study assumed only a day shift, the throughput capacity for a berth is 2,000 container batches. This study hypothesized the capacity of Post-Panamax and Super Post-Panamax by the same approach.

Warm-up Period and Run Time

The average lead-time for a container in the system will range from 15 to 45 days. The lead-time starts from when the orders are placed until delivery at the inland rail-truck terminals. However, the system does not have initialized work-in-process (WIP) inventory and running process for the entities in the first period, thereby generating bias for the system performance. Thus, it is essential to set up the warm-up period to be three months (January 1, 2011 – March 31, 2011), and have the system run for one year, collecting data in order to measure the performance (April 1, 2011 – March 31, 2012) by calendar format. After investigation of the animation, the warm-up period increased two months more since the vessel-shipping pattern reaches random status in the system.

Researchers run 30 replications to collect the average throughput and the variability of the mean value. The run time from the test run was extremely slow due to the 80 million entities (containers) a year in the system. Based on the average lead-time in the system, around 10 million containers stayed in the system and were recorded by the system. To increase the system performance, researchers decided to create a batch order. For example, the locomotive hauls around 120 TEU boxes at once, so 120 TEUs are considered as one container-batch. The total entities arrived in the system a year was reduced to 0.5 million entities.

Due to the nature of stochastic simulation, the study needs to select the sample size for estimating a population mean by each scenario (Mendenhall and Sincich, 2003: 243-244). The number of replications can be acquired by error of the estimator of the parameter as follows:

$$\sqrt{r} = \frac{t_{\alpha/2}(\sigma)}{B} \quad (1)$$

, where r = the number of replications for simulation run; σ = parameter variation based on the initial runs; B = tolerance range for the 95% confidence interval, i.e. half width of the interval

To estimate the number of replications each scenario needs for statistics, researchers used the Stat:Fit utility embedded in ProModel® (Harrel et al., 2003). First, the model ran an initial 10 replications to acquire the standard deviation providing the sigma value of 32.81. The 4,000 TEU vessel, a Panamax, loads 26.6 batch orders in the system (one batch represents 150 TEUs). The estimation by 95% confidence level recommended 26 replications. To reduce the risk of the estimation of the appropriate replications, the model ran 30 replications for the precise estimation, therefore having 27.81 sigma values. The estimation recommends that 20 replications be run. In terms of the system performance, 30 replications run at reasonable run-time and provide higher confidence level with 95%.

Performance Measurements

This study measures the performance of the scenarios by the container throughput in TEUs. For validation, the dashboard displays the throughput through the ports and inland terminals.

The screen is also adjustable with the view menu, so the locations can easily be checked. With respect to the final delivery, the final throughput of the disruption scenario at the rail-truck terminals was compared with the baseline scenario. The model hypothesizes that the throughput will be the same as the baseline since the alternative routes can perform the logistics activities to serve the U.S. markets. Thus, utilizing resources in neighboring nations would give an alternative option instead of expanding of the U.S. infrastructure. As an alternative option, the Canadian and Mexican ports would be feasible based on the performance of port operations and the hinterland transportation.

To test the significance of the scenarios, pair-wise comparison was conducted based on the 30 replications for all possible pairs; each replication for a year with a one month warm-up period to reduce the variability due to the initializing phase. The pairs in comparison are Scenario I and Scenario II; Scenario II and Scenario III; and Scenario I and Scenario III. This simulation tests a pairwise comparison. The tests are conducted at the 95% confidence level, which is 5% significance level (α=0.05). This study conducted t-tests based on the hypothesis:

$$H_1 : \mu_{scenario\_I} = \mu_{scenario\_II} = \mu_{scenario\_III} \quad (2)$$

$$H_0 : \mu_{scenario\_I} \neq \mu_{scenario\_II} \vee \mu_{scenario\_I} \neq \mu_{scenario\_III} \vee \mu_{scenario\_II} \neq \mu_{scenario\_IIII} \quad (3)$$

, where the symbol ˅ means or. To conduct the hypothesis test, the simulation requires three comparisons (K(K-1)/3=3 pairs with K strategies). The $\mu_{scenario\_I} \neq \mu_{scenario\_II}$ can be rewritten as $\mu_{scenario\_I} - \mu_{scenario\_II} \neq 0$, so the pair-wise t-tests used 0 as hypothesized mean difference.

The α =0.05 is used an overall significance to evaluate the hypothesis. Since we compare three alternative strategies (K=3), the α_i are described as:

$$\alpha_i = \frac{\alpha}{K(K-1)/2} \quad \text{for i= 1,2,3……., K(K-1)/2} \tag{4}$$

$$\alpha_i = \frac{0.05}{3(3-1)/2} = 0.005 \qquad \alpha_1 = \alpha_2 = \alpha_3 = 0.017 \tag{5}$$

Sensitivity Analysis

Two scenarios conducted sensitivity analysis and compared with the base scenario, which included a base line scenario, partially disrupted scenario, and fully disrupted scenario. Sensitivity II tests two extreme situations. In terms of disruption period, the sensitivity II experiments Scenario II for a yearlong disruption. Sensitivity III experiments the scenario two, which simulate the full disruption at the Port of Long Beach. The sensitivity scenario tests the second scenario where there is disruption two for a yearlong period at this port. Sensitivity of Scenario I, II, and III plots a normality test at a 95% confidence level. The points are normally distributed from the population showing p-value over 0.05.

The basic descriptive statistics summarizes Table 5. The 95% confidence interval for each scenario shows significance differences exists between the sensitivity scenarios. Based on the 95% confidence level, the first sensitivity scenario (Sensitivity I) shows a low level of 8,460 container batches and upper level of 8,473 container batches. One container-batch represents 150 TEUs. The partially disrupted scenario (Sensitivity II) for a year shows that the confidence level has an interval between 7,328 and

7,346 container batches. It shows a 13.3 % decrease of the normal throughput in the system. However, the full disruption scenario (Sensitivity III) shows that the confidence level has an interval between 8,354 and 8,347, which indicates a 1.3% decrease from the normal performance of the system. The 12.0% gap between the partial disruption scenario and the full disruption scenario indicates 994 container batches (i.e. 119,280 TEUs). The number represents around 30 vessels in term of 4,000 TEU vessels.

The partial disrupted sensitivity scenario shows the worst case due to longer waiting time. However, it is not directly interpretive for a strategic approach due to the abnormal situation of yearlong disruption and no trip diversion. On the contrary, the fully disrupted sensitivity scenario shows positive output, which shows the high throughput. For the scenario, the study assumed that capacity of the ports of Mexico is similar to the port of Long Beach. It is also an extreme case due to the yearlong trip diversion replacing the demand by the ports of Manzanillo and Lazaro Cardenas without competition.

Table 5. Average Throughput and Confidence Interval for the Output for Sensitivity Analysis

	Normal (Sensitivity I)	Partial Disruption (Sensitivity II)	Full Disruption (Sensitivity III)
Average	8,466.9	7,337.1	8,351.1
Min	8,434.0	7,289.0	8,332.0
Max	8,501.0	7,386.0	8,369.0
Standard Deviation	16.6	24.0	9.79
95% C.I. High	8,473.2	7,346.1	8,354.72
95% C.I. Low	8,460.7	7,328.2	8,347.41

Results

This study conducts a set of experiments with three scenarios: a base line scenario, a partially disrupted scenario, and a fully disrupted scenario. The estimated points are located within the 95% confidence interval The Normal probability plot of three scenarios roughly also follows and straight line. The p-value is larger than 0.05 and the Anderson-Darling test is low, so it concluded that the data are normally distributed. The Anderson-Darling test compares the empirical cumulative distribution function (CDF) of the simulation replication outputs with the expected normal distribution.

Based on the 30 replications for each scenario, researchers performed the pair-wise t-test to determine the significant difference between a pair of scenarios. For the paired t-test, the goodness of fit test for normality was executed based on the normality test. The differences of a pair of scenarios show that the point of differences are normally distributed from the population with p-values over 0.05 and low Anderson-Darling values. However, the points of differences between Scenario I and Scenario II shows a p-value over 0.079, which is greater than 0.05, so the normality test was conducted for the differences to examine it closely. The points appear normally distributed. Thus, the pair-wise t-tests are performed for comparison of the three pairs.

Table 6 provides the results of the pair-wise t-tests for three pairs of scenarios. The p-values of two pairs, Pair I and Pair II, show p-values under 0.05, thereby indicating that there exists a significant difference for the two pairs. Pair I indicates that Scenario II versus Scenario I shows a decrease in the throughput by approximately 1,235 container batches, which is equivalent to 148,200 TEUs during the simulation run time. The throughput difference represents approximately 37 vessels in the queue at

the port of Long Beach for unloading including rail shipping. The difference indicates 14.6% decrease in average throughput capacity under normal operation compared to the partial disruption scenario for two months.

Scenarios I and III were compared with Pair II, and showed p-values under 0.05. The p-value indicates significant difference exists in Pair II by a decrease of 1,226.4 container batches. The decrease represents 147,120 TEUs, which indicates there are approximately 37 vessels for 4,000 TEUs in the stream of the supply chain system. The 37 vessels explain a 14.5 % decrease from the base line scenario. Thus, the tests show that both the full disruption and partial disruption scenarios demonstrate a significant change in the throughput due to two month's disruption at the Port of Long Beach.

Table 6. Average Throughput and Confidence Interval for the Simulation Output

	Pair I		**Pair II**		**Pair III**	
	Scenario I	**Scenario II**	**Scenario I**	**Scenario III**	**Scenario II**	**Scenario III**
Mean	8466.93	7231.03	8466.93	7240.47	7231.03	7240.47
Standard Deviation	16.64	45.38	16.64	38.05	45.38	38.05
Sample size	30	30	30	30	30	30
Hypothesized Mean Difference	0		0		0	
Degree of Freedom	30		30		30	
t-value	140.08		155.18		-0.88	
p-value	0.000		0.000		0.388	
Difference Mean	1235.90		1226.47		-9.4	
95% CI (Upper)	1253.94		1242.63		12.6	
95% CI (Lower)	1217.86		1210.30		-31.4	

Pair III presents the difference between Scenario II and Scenario III for the partial disruption and full disruption. Scenario II versus Scenario III presents no significant differences between the two scenarios according to a p-value greater than 0.05. The pair indicates that either option, waiting in the longer queue during recovery at Long Beach or diverting the trips to the ports of Manzanillo and Lazaro Cardenas in Mexico, will be the same with regard to short-term disruption. Several reasons explain the possibility of trip diversion during the disruption: (i) shorter distance of rail to Memphis, St. Louis, Houston, Dallas, and Atlanta, (ii) fast loading and unloading at the ports in Mexico without congestion, and (iii) double-stack railway systems with a smart port system by Kansas City Southern railway.

In general, both disruption scenarios show a decrease in throughput by slowing the delivery to market. The sharing of resources in Mexico is demonstrated to be a better solution than a strategy using only the U.S. ports, especially for long-term disruptions as shown in the sensitivity analysis.

CONCLUSION

This paper presents the modeling and analysis of the containerized freight imported into the U.S. markets through intermodal networks including marine and railways when a port disruption occurs. Researchers developed a discrete-event simulation model to demonstrate the impact of port disruption on the global supply chain. The model also describes the impact of intermodal connections using secured routes and their impact on global economics sustainability. Owing to the nature of complexity in the global supply chain, the discrete-event

simulation model provides strategic approaches for supply chain planning and efficient operations.

In the supply chain, a variety of agents, which are entities in the model, are vulnerable to both natural and man-made disasters. In case of an emergency with a longer than usual recovery time, the supply chain planners can determine trip diversion or plan for a longer wait time in a queue. Depending on the agents, the decision process and results will vary in a case-by-case basis. In this model, we conducted the experiments for partial disruption with short-term impact on a port and fully disrupted scenario with long-term impact.

The output from the simulation highlights the significance of the impact from a long -term disruption, while the short-term disruption in the supply chain would need resilience with a quick response time to allow the system to recover. The long-term disruption scenario recommendation is to immediately divert the flow to the neighboring infrastructure, which has similar and excess capacity. The short-term disruption scenario requires a decision-making process based on the diversion time and cost, and the search process required for finding the neighboring ports and landside resources that are capable to handle the extra freights. Thus, the partially disrupted scenario does not recommend diverting to other neighboring infrastructure.

The strategic alliance between the ports in Canada and the intermodal terminals in U.S. and between the ports in Mexico and the U.S. railroad systems would provide adequate responses to the disruption scenarios in the U.S. by securing the supply chain in U.S. markets. This paper has several drawbacks in term of the complexity and datasets. Due to the complexity of the model and the large scale considered for the supply chain, it became essential to represent a variety of agents focusing on strategic alliance between freight forwarders, shippers, and

carriers as operators. The level of aggregation was too large to represent all agents and various decisions.

REFERENCES

American Association of Port Authorities, North American Container Port Traffic in TEUs, 2011.

Association of American Railroad, Statistics and Publication: Rail Performance Measures, Washington D.C., USA, 2011.

Bragdon, C. R., Transportation Security. Burlington, MA: Butterworth-Heinemann, 2008.

Chang, T., Best Routes Selection in International Intermodal Networks, Computers & Operations Research, 35(9), 2008, 2877-2891.

Dalal, M. A. and Jensen, L.P., Simulation Modeling at Union Pacific Railroad, In Proceedings of the 2001 Winter Simulation Conference, Arlington, VA, USA, 2001, 1048-1055.

Ernesto, L. and Rivero, B., Applications in Logistics Using Simulation with Promodel, The Second LACCEI International Latin American and Caribbean Conference for Engineering and Technology, Miami, Florida USA, Paper No.007 , 2004, 1-6.

Fan, L., Optimization Model for Container Shipment to USA. PhD Dissertation. North Dakota State University, Fargo, ND, USA, 2010.

Global Insights, Implications if Larger Share of Imports Comes Through Mexican and Canadian Ports and is Transferred to Rail/Trucks for Transport into the United States, Commission Briefing Paper 4B-03 for National Surface Transportation Policy and Revenue Study Commission,

Washington D.C., USA, 2007.

Harrell, C., Ghosh, K. B.,= and Bowden, R.O. Jr., Simulation Using Promodel®. McGraw Hill, 2nd Edition, Singapore: ISBN 007-123243-5, 2003.

Hawker, S. J., Falzarano, A., Ketha, S., Korfmacher, K., Winebrake, J., and Zilora, S., Intermodal Transportation Network Custom Evaluation for Environmental Policy Analysis, ESRI 2007 User Conference: Paper 1536, 2007.

Intermodal Association of North America, Data and Statistics: Intermodal Industry Statistics, 2011.

Kraenzle, H., Monitoring Shipping Containers Using ArcGIS, ESRI User Conference, San Diego, CA, USA, 2006, Retrieved from http://proceedings.esri.com/library/userconf/ hss06/docs/ shipping.pdf, <Accessed on February 12, 2010>.

Leachman, R.C., Final Report - Port and Modal Elasticity Study, Phase II. Southern California Association of Governments (SCAG), CA, USA, 2010.

Leachman, R.C., Theodore, P., and Thomas, B.R. September, Port and Modal Elasticity Study, California: Southern California Association of Governments, CA, USA, 2005.

Lee, E., Spatiotemporal Simulation Model for Global Containerized Freight in North America. PhD Dissertation. North Dakota State University, Fargo, ND, USA 58103, 2011.

Lee, E., Oduor, G.P., Farahmand, K., and Tolliver, D., Heuristic Path-Enumeration Approach for Container Trip Generation and Assignment, Journal of Transportation Research Forum, 50(3), 2011, 7-21.

Lee, T., Park, N., and Lee, D., A Simulation Study for the Logistics planning of a Container Terminal in View of SCM, Maritime Policy and Management, 30(3), 2003, 243-254.

Levine, B., Nozick, L., and Jones, D., Estimating an Origin-Destination Table for US Imports of Waterborne Containerized Freight, Transportation Research E, 45(4), 2009a, 611-626.

Levine, B., Nozick, L., and Jones, D., Estimating an Origin-Destination Table for US Exports of Waterborne Containerized Freight, Maritime Economics and Logistics, 11(2), 2009b, 137-155.

Maloni, Michael and Paul, Jomon A., Evaluating Capacity Utilization Options for US West Coast Container Ports, 52(1), Winter 2013, 52-79.

Martagan, T. G., Eksioglu, B., Eksioglu, S. D., and Greenwook, A. G., A Simulation Model of Port Operations during Crisis Conditions, In Proceedings of the 2009 Winter-Simulation Conference, Austin, TX, USA, 2009, 2832-2843.

Mendelhall, W., and Sincich, T., A Second Course in Statistics: Regression Analysis, 6th edition, Prentice Hall, Upper Saddle River, NJ, USA, ISBN: 0-13-022323-9, 2003.

NISAC (National Infrastructure Simulation and Analysis Center), SIERRA: System for Import/Export Routing and Recovery Analysis, U.S. Department of Homeland Security, Sandia National Laboratory, Albuquerque, NM, USA, 2009.

NSTPRSC (National Surface Transportation Policy and Revenue Study Commission), Transportation for Tomorrow. Report of the National Surface Transportation Policy and Revenue Study Commission, Washington D.C., USA, 2007, http://transportationfortomorrow.com/final_report/report_html.htm, <Accessed on April 3, 2011>.

Panayides, Photis M., Maritime Logistics and Global Supply Chains: Towards a Research Agenda, Maritime Economics & Logistics, 8(1), 2006, 3-18.

Rensburg, J. J., He, Y. and Kleywegt, A. J., A Computer

Simulation Model of Container Movement by Sea, In Proceedings of the 2005 Winter-Simulation Conference, Orlando, FL, USA, 2005, 1559-1566.

Sheffi, Y., Supply Chain Management under the Threat of International Terrorism, International Journal of Logistics Management, 12(2), 2001, 1-11.

U.S. Department of Homeland Security, Fact Sheet, Customs and Border Protection, Washington D.C., USA, 2007, Retrieved from http://www.cbp.gob, <Accessed on October 30, 2010>.

U.S. Department of Transportation, North America Border Crossing/Entry Data, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Washington D.C., USA, 2010.

U.S. Department of Transportation, America's Container Ports: Linking Markets at Home and Abroad, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Washington D.C., USA, 2011.

Vorst, J., Beulens, A., and Beek, P., Modeling and Simulating Multi-Echelon Food Systems, European Journal of Operational Research, 122, 2000, 354-366.

Wan, Y., Zhang, A. and Yuen, Andrew C. L., Urban Road Congestion, Capacity Expansion and Port Competition: Empirical Analysis of US Container Ports, Maritime Policy & Management, 40(5), 2013, 417-438.

Zhuang, J. and Mier, M. V., Balancing Terrorism and Natural Disasters – Defensive Strategy with Endogenous Attacker Effort, Operations Research, 55(5), 2007, 976-691.

Importance of Technical and Fundamental Analysis and Other Strategic Factors in the Indian Stock Market

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ABSTRACT

This paper presents findings of an online questionnaire survey on the perceived importance of chartist/technical and fundamental analysis and the different strategic factors in the stock price forecasting by stock brokers of Bombay Stock Exchange, India. Stock brokers rely more on technical analysis vis-à-vis fundamental analysis at shorter forecasting horizons and rely more on fundamental analysis at longer forecasting horizons.

Regarding the use of chartist / technical and fundamental analysis on seven forecasting horizons, four distinct forecasting styles among stock brokers could be identified through cluster analysis. Also our results suggest that Company Specific Factors was rated the most important and Other Factors was rated the least in stock price forecasting in long term by brokers.

Keywords: stock brokers; technical analysis; fundamental analysis; strategic factors.

INTRODUCTION

As in all financial markets, primary question in the stock market is how market participants and stock traders forecast future market prices. How we forecast stock market prices now and in the future influences major economic and social policy decisions that affect not only investors but also society at large.

The two general techniques for predicting stock market prices used by market professionals are “chartist" or "technical" analysis and fundamental or intrinsic value analysis. Technical, or chartist, analysis of financial markets involves providing forecasts of asset prices or buy/sell advice on the basis of visual observation and examination of the past history of price movements (Edwards et al., 1967), perhaps with the aid of certain quantitative techniques such as momentum indicators and moving averages (Murphy, 1986), without considering any fundamental factors. Fundamental Analysis is a method of evaluating a stock by attempting to measure its intrinsic value. Fundamental analysts study everything from the overall economy and industry conditions, to the financial condition and management of companies. In other words, fundamental analysis

is about using real data to evaluate a stock's value. The method uses revenues, earnings, future growth, return on equity, profit margins and other data to determine a company's underlying value and potential for future growth.

Despite the increasing professional interest in non-fundamental factors, there is little empirical evidence on the prevalence and usage of such techniques in the Indian stock market. Goodman (1980) examines the performance of technical analysts, but does not provide evidence on the importance and usage which markets attaches to their advice. Mitra (2009) , Kakani et al., (2006) and Pampana et al., (2005) analyses the profitability of different technical trading rules in the Indian stock market but, has not directly compared the usage of technical and fundamental analysis tools and the importance given to strategic factors by brokers in the Indian stock market.

This is the first study concerned with how professional traders forecast stock rate movements in India. Given that India is the 2nd largest stock exchange market in terms of market capitalisation among emerging and developing countries and the fact that brokers' views are an important factor driving stock price movements, this study may enhance understanding of stock price analysis and forecasting.

This study tries to extend the results of previous works done on the use of technical analysis and fundamental analysis among foreign exchange traders in London (Taylor et al., 1992) and work done in Hong Kong (Lui et al., 1998) and work done in the European foreign exchange market (Oberlechner, 2001) and work done by Menkhoff (Menkhoff, 2010) to a new geographic location and to a new financial market. This is the first study which determines the usage and perception of technical and fundamental analysis and importance given to strategic factors by brokers in the Indian stock market.

To examine the importance that brokers' personally give to fundamental and technical analysis over seven forecasting horizons: intraday, 1 week, 1 month, 3 months, 6 months, 1 year and beyond 1 year.

To investigate the importance of Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors, Company Specific Factors and Other Factors on stock price forecasting in long term.

The first objective was to examine the importance that brokers' personally give to fundamental and technical analysis over seven forecasting horizons: intraday, 1 week, 1 month, 3 months, 6 months, 1 year and beyond 1 year. Attempt was made to understand the relative importance brokers attach to chartist / technical analysis versus fundamental analysis of stocks over seven forecasting horizons.

The second objective was to investigate the importance of Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors, Company Specific Factors and Other Factors on stock price forecasting in long term. Attempt was made to understand the importance of the above factors that brokers take into consideration, while making investment in the stock market in long term.

LITERATURE REVIEW

The two general techniques for predicting stock market prices used by market professionals are "chartist" or "technical" analysis and fundamental or intrinsic value analysis.

"The technical approach to investment is essentially a reflection of the idea that prices move in trends which are determined by the changing attitudes of investors toward a variety of economic, monetary, political and psychological

forces…Since the technical approach is based on the theory that the price is a reflection of mass psychology ("the crowd") in action, it attempts to forecast future price movements on the assumption that crowd psychology moves between panic, fear, and pessimism on one hand and confidence, excessive optimism, and greed on the other." (Pring, 1991)

Another approach which is rather different from technical approach is fundamental analysis or the intrinsic value method. The assumption of the fundamental analysis approach is that at any point in time an individual security has an intrinsic value which depends on the fundamentals of the security (earning potential of the security). The future earning potential of the security depends on factors like quality of management, outlook for the industry and the economy. Through a careful study of these fundamental factors the analyst should, be able to determine whether the actual market price of a security is above or below its intrinsic value (Fama, 1965).

Since the early 1980s, models based on economic fundamentals have been poor at

explaining the movements in the exchange rates (Meese, 1990). Post world war, many of the financial economists believed technical analysis with skepticism (Malkiel, 1985; Sharpe, 1985). This skepticism might have developed from the efficient markets hypothesis, which says that speculators who do not concentrate on underlying economic fundamentals when trading will be quickly driven out of the market by smart money.

Prices can exhibit substantial short-run deviations from fundamentals due to the role of market sentiment, noise traders and limits to arbitrage. The novel time-series framework reveals that the recognition of asymmetric dynamics over the cycle (bull and bear markets) is crucial for reconciling such apparently persistent deviations and the overall mean reversion in valuation

ratios. Thus, the results not only underline the importance of noise trading and market sentiment in the short run but also corroborate that prices reflect fundamentals in the long run (Coakley et al., 2006).

As per Keynes (Keynes, 1936) financial markets are also influenced by non-fundamental factors. Any general analysis of exchange rates examines underlying economic fundamentals to explain the movements in the exchange rates, but there were situations where current fundamentals based models fail to explain the past completely, or forecast the future reliably (Dornbusch,(1976, 1987); Frankel etal., (1986, 1990a), suggest that technical analysis could have largely been responsible for the overvaluation of US dollar during the 1980's, during which period, pressure in the opposite direction was signaled by the economic fundamentals. Because of such failures, academicians and researchers have started to look into the role of non-fundamental factors influencing financial markets.

Allen et al. (1990) in their paper provides some empirical evidence concerning the nature and perceived importance of one particular kind of non- fundamentalist analysis namely chartism, in the London foreign exchange market. In questionnaire survey conducted in Germany among professional foreign exchange market participants found that rational participants use non-fundamental analysis to exploit less rational noise traders (Menkhoff, 1998). Frankel et al., (1988) developed a model that uses two approaches to forecast the exchange rate: the fundamentalist approach, which bases the forecast on economic fundamentals, and the chartist approach, which bases the forecast on the past behaviour of the exchange rate.

That 90% of the foreign exchange dealers based in London give some importance on this type of non-fundamental analysis (technical analysis) when forecasting exchange rates. Traders

rely more on technical analysis vis-à-vis fundamental analysis at shorter forecasting horizons and rely more on fundamental analysis at longer forecasting horizons. Most of the traders view technical analysis as complementary to fundamental analysis and significant number of them suggests that technical analysis may be self-fulfilling (Taylor et al., 1992).

In a questionnaire survey conducted among foreign exchange dealers in Hong Kong on the usage of fundamental and technical analysis, more than 85% of them said that they use both fundamental and technical analysis for forecasting exchange rate movements at different time horizons. Traders rely more on technical analysis vis-à-vis fundamental analysis at shorter forecasting horizons and rely more on fundamental analysis at longer forecasting horizons. Technical analysis is considered somewhat more useful in forecasting trends than fundamental analysis, but significantly more useful in predicting turning points. Interest rate related news is found to be relatively important fundamental factor in exchange rate forecasting, while moving average and or other trend-following systems are most useful technical techniques. Nevertheless, they are both given less weight than news about central bank intervention in influencing intraday exchange rate movements. Their results also imply that the two analyses are complementary to each other (Lui et al., 1998).

In a questionnaire and an interview survey on the perceived importance of fundamental and technical analysis among foreign exchange traders and financial journalists in London, Frankfurt, Vienna, and Zurich finds that most of the traders use both forecasting approaches and shorter the forecasting horizon, the more important technical analysis is. Financial Journalists place more importance on fundamental analysis than do foreign exchange traders on all forecasting

horizons investigated. Four distinct clusters of traders can be identified when you analyze over seven forecasting horizons (Intraday trading to more than 1 year) regarding use of technical and fundamental analyses (Oberlechner, 2001).

Surveys conducted later also confirm many of these early findings that traders use both technical and fundamental analysis and the usage of technical analysis is much more frequent than they do fundamental analysis at shorter horizons. Cheung et al., (2001) find that 30% of U.S. foreign exchange traders could best be characterised as technical analysts and that an increasing percentage use technical analysis. Cheung et al., (2004) confirm previous findings that traders pay more attention to non-fundamental factors at shorter horizons.

Investor sentiment and limited arbitrage do play role in determining asset prices (Shleifer et al., 1990). Neely et al., (2003) examine the out-of-sample performance of intraday technical trading strategies selected using two methodologies, a genetic program and an optimised linear forecasting model. Trading rules discover some remarkably stable patterns in the data but when transaction costs and trading hours are taken into account, they find no evidence of excess returns to the trading rules derived with either methodology.

In survey evidence from 692 fund managers in five countries, found the vast majority rely on technical analysis. When the forecasting horizon was very short, technical analysis was the most important form of analysis and thus more important than fundamental analysis. Technical analysts were found to be as experienced, as educated, as successful in their career as others. Technical analysis was found to be more popular in smaller asset management firms. What they found most significant is the relation of technical analysis with the view that prices are heavily determined by psychological influences.

Consequently, technicians apply trend-following behaviour (Menkhoff, 2010).

Irrational investor behaviour resulted in excess bond and stock market volatility (Shiller, 1984). In a study conducted in U.S. equity market to test whether intraday technical analysis is profitable, it was found that market participants place more emphasis on technical analysis (and less on fundamental analysis) the shorter the time horizon. They found that using two bootstrap methodologies, that none of the 7846 popular technical trading rules tested are profitable after data snooping bias is taken into account. There is no evidence that the market is inefficient over this time horizon (Marshall et al., 2008). Kakati's (2005) work done examines the four aspects of valuation process. Factors/variables considered, sources of information, forecasting techniques used and valuation methodology. Each respondent was also asked to indicate the current performance of his/her portfolio against his/her expectation level and the Sensex or any other index they use as benchmark. The Cluster analysis reveals three distinct styles which are active style, passive style and balanced style. While active and balanced style seems to surpass both the investors' own expectations and Sensex return, the passive style performs below expectation and Sensex. Step-wise regression shows that none of the economic, industry and firm variables considered in the study could lead to variation in the portfolio performance. It appears that the performance of portfolio does not depend on what variables are considered in the valuation of stocks. The most influencing aspect appear to be use of dividend discount model of expected stock returns driven by the top management forecast data.

Mitra (2009) in his paper analyses the profitability of moving average based trading rules in the Indian stock market using four stock index series. The results indicate that most

technical trading rules are able to capture the direction of market movements reasonably well and give significant positive returns both in long and short positions however these returns cannot be exploited fully due to the presence of transaction costs. Kakani et al., (2006) in their study used the Simple Moving Average (SMA) and the Displaced Moving Average (DMA) trading rules to test the weak form of efficiency on Indian stock market indexes Standard and Poor (S & P) CNX Nifty, BSE Sensex as well as multiple individual stocks for a time period of 15 years (1991–2005).Their results indicate that even after adjusting for transaction costs there was sufficient evidence that the DMA indicator is a highly successful trading rule that generates profitable signals. Pampana et al., (2005) in their study observed the profitability of applying technical trading rules using single moving averages of 5, 10, 30, 50, 100, 150 and 200 days, and dual moving averages (of various combinations) to the daily closing values of the S&P CNX Nifty index of the National Stock Exchange of India. Their results indicate that in spite of presence of transaction costs, making trading decisions based on moving average rules leads to significantly higher returns than the buy-and-hold policy. Another observation was that the shorter period single moving averages (5, 10, 30 days) and dual moving averages give better returns than longer period single moving averages.

In the study conducted for evaluating the economic feasibility of technical analysis in the Indian stock market, it was found that technical indicators do not outperform Simple Buy and Hold strategy on net return basis for individual stocks. Even though technical indicators seem to do better during market upturns compared to market downturns, technical based trading strategies are not feasible vis-à-vis passive strategy irrespective of market cycle conditions. Technical indicators also do not provide economically significant profit for industry as well as

economy based data (Sehgal et al., 2007).

Lo et al., (2000), propose a systematic and automatic approach to technical pattern recognition using non-parametric kernel regression, and applied this method to a large number of U.S. stocks from 1962 to 1996 to evaluate the effectiveness of technical analysis. They find that over the 31-year sample period, several technical indicators do provide incremental information and may have some practical value. Wong et al., (2003) in their paper say that technical analysis has a role in signaling the timing of stock market entry and exit. Moving Average and Relative Strength Index were used on Singapore Straits Times Industrial Index (STII) data and the results indicate that the indicators can be used to generate significantly positive return. It is found that member firms of Singapore Stock Exchange (SES) (No transaction costs for members) tend to enjoy substantial profits by applying technical indicators and found that most member firms do have their own trading teams that rely heavily on technical analysis.

How we forecast stock market prices now and in the future influences major economic and social policy decisions that affect not only investors but also society at large, even the world. (Shiller, 2000).

RESEARCH METHODOLOGY

After the selection and formulation of research problem, the resea rcher has worked out the following research design. Research desi gn covers the following aspects.

Primary data for finding importance of chartist/technical a nd fundamental analysis and the usage of chartist methods and s ervices and valuation techniques was collected through conductin g a well-structured online questionnaire survey.

Table 1-1. Research Methodology Framework

Number	Topic	Sub-topic
1.1.1	Sources of data	Primary data Secondary data
1.1.2	Sampling Plan	Sampling units Sample size Sampling procedure Sampling contact method
1.1.3	Methods of data collection	Design of Questionnaire Testing of Questionnaire
1.1.4	Data analysis tools and techniques	One way ANOVA t-test Chi-square test

Sources of data: The study was based on both Primary data and Secondary data.

Secondary data is the data which already exists in various sources like, newspapers, magazines, journals, company brochure s, Census reports, Government reports, etc. Internet has emerged as a major source of collecting secondary data. Sources of seconda ry data for the current research were as follows:

- Research works of various scholars.
- Journals and Magazines.
- Websites of regulators like SEBI, RBI.
- Databases like Science Direct.
- Journals and Magazines.
- Web sites of stock exchanges like NSE and BSE.
- Books and other literature in the following related ar eas: Corporate Finance, Technical Analysis, Valuatio n, Research Methodology, etc.
- Newspapers and Articles.

Sampling Plan

The sampling plan for the current thesis constituted of sam pling units, sample size, sampling procedure and sampling contac t method.

The sampling units contacted were corporate brokers regist ered with Bombay Stock Exchange.

Sample comprised of 262 respondents selected using proba bility random sampling technique. The sample size of 262 is justif ied using the most popularly used equation based on precision rat e and confidence level (Kothari, 2004). To calculate the sample siz e 'n', size of the population 'N' is required. From the regulator of s tock market, Securities and Exchange Board of India website , th e total corporate broker population (N) in the Bombay Stock Exch ange for the year ending 2009-10 was identified as 826. Thus sam ple size is calculated as below (Table 1.2):

Table 1-2. Determination of Sample Size

$$n = \left\{ \frac{Z^2(pq)N}{e^2(N-1) + Z^2(pq)} \right\}$$

$$n = \left\{ \frac{(1.96)^2(0.5 \times 0.5)826}{(0.05)^2(826-1) + (1.96)^2(0.5 \times 0.5)} \right\}$$

$$n = \frac{793.2904}{(0.0025)(826-1) + 0.9604}$$

$$n = 262$$

Z= 1.96,
N=Population
n =Sample size,
p=sample proportion 0.5, q = (1-p) = 0.5,
e = 0.05 (within 5% of True value)

Source: Kothari (2004)

Probability random sampling technique was used for the p

urpose of collecting the sampling units. Sample units of 262 were, then selected using simple random sampling technique using ran dom number generation method and rand between function.

The selected sampling units (corporate brokers in this case) were approached via online survey through their email addresses. Survey Monkey was used to conduct the online survey.

Methods of Data collection

The current research required primary data. For this purpo se, questionnaire was used.

First of all information needed for research work was specif ied. Required demographic data included was age, gender, locatio n of the office, email address, relevant work experience.

For objective one, brokers were asked to indicate on the 10 point Likert scale the relative importance they attach to technical analysis versus fundamental analysis of stocks over seven foreca sting horizons: intraday, 1 week, 1 month, 3 months, 6 months, 1 year and beyond 1 year. A score of zero would indicate the use of pure chartist (technical) analysis alone at that horizon and a scor e of ten would indicate the use of pure fundamental analysis and an intermediate score would indicate a weighted mix of technical analysis and fundamental analysis.

For objective two, brokers were asked to rate on the 5 point Likert scale the importance of the different factors that they take into consideration while making investment in the stock market i n the long term. Scale indicating very important at one end to ver y un-important at the other end was used.

We sent respondents the link to the questionnaire through email, thus conducting online web based survey for collecting pri mary data.

Testing of questionnaire

It was decided to test the validity and reliability of the questionnaire. For this purpose, firstly the researcher has identified different approaches available. There are various methods of testing a questionnaire like Test/Retest approach, Test of face validity, conducting pilot study, etc. (Malhotra, 2007). Pilot study was conducted.

Data analysis tools and techniques

In order to extract meaningful information from the raw data collected, the data analysis was carried out by the researcher. The data were first edited, coded and tabulated for the purpose of analysing them. The analysis was conducted by using simple statistical tools like percentages, averages and measures of dispersion. Diagrams, graphs, charts and pictures were used.

One way ANOVA, t-tests and Chi-square analysis were used for the purpose of testing the hypotheses. Data analysis software SPSS (version 19) package was used to conduct, one way ANOVA, t-tests and Chi-square tests.

Data Analysis & Interpretation

For conducting the research on the use of technical and fundamental analysis among corporate brokers of Bombay Stock Exchange, a sample of 262 respondents (Table 1.2) were selected using probability random sampling technique. The sample size of 262 was justified using the most popularly used equation based on precision rate and confidence level (Kothari, 2004). Among 262 corporate brokers 152 corporate brokers participated in the survey. Response rate was 58%.

Out of 152 responses males were 142 (93.4%) and the rest 10 were females (6.6%). Following table and subsequent Chart present this data:

Table 1-3. Age Groups of the Respondents

Age Groups of the Respondents		
Age Group	Response Percent	Response Count
Under 25	7.9%	12
26 to 35	50.7%	77
36 to 45	25.0%	38
46 to 55	13.2%	20
56 to 65	3.3%	5
66 to 75	0.0%	0
Over 75	0.0%	0
TOTAL	100%	152

AGE GROUPS

Next important demographic information of the respondents was their age group.

Table 1-4. Age Groups of the Respondents

Age Groups of the Respondents		
Age Group	Response Percent	Response Count
Under 25	7.9%	12
26 to 35	50.7%	77
36 to 45	25.0%	38
46 to 55	13.2%	20
56 to 65	3.3%	5
66 to 75	0.0%	0
Over 75	0.0%	0
TOTAL	100%	152

The above table and Chart present the age groups of the respondents who participated in the survey. Out of 152 respondents, 7.9% were less than 25 age, 50.7% in the age group of 26-35, 25.0% in the age group of 36-45, 13.2% in the age group of 46-55, 3.3% in the age group of 56-65 and 0% in the age group of 66-75 and over 75. Most of the respondents were in the age group of 26-35.

RELEVANT WORK EXPERIENCE

Next important demographic information of the respondents was the relevant work experience they had. We categorised them into three groups based on the work experience they had. These categories were Junior Level, Middle Level and Senior Level.

Table 1-5. Relevant Work Experience

Relevant Work Experience		
CATEGORY	Response Percent	Response Count
Junior Level	19.74%	30
Middle Level	40.13%	61
Senior Level	40.13%	61
TOTAL	100%	152

The above table present the categorisation of relevant work experience of the respondents who participated in the survey. Ou t of 152 respondents, 19.74% were in the Junior Level category, 4 0.13% were in the Middle Level category and 40.13% were in the Senior Level category. Most of the respondents were in the Middl e and Senior Level category.

Objective 1-Time Period Analysis

ANOVA One Way Using SPSS

First objective of the current research was to examine the importance that brokers' personally give to fundamental and technical analysis over seven forecasting horizons: intraday, 1 week, 1 month, 3 months, 6 months, 1 year and beyond 1 year. Hence it was decided to conduct means test using one way ANOVA (Oberlechner, 2001). For this purpose, basing on the literature available, following hypotheses were set up and further tested.

HYPOTHESIS

Ho: Mean Importance ratings over seven forecasting horizons are equal i.e.

$\mu_{intraday} = \mu_{1week} = \mu_{1\ month} = \mu_{3\ months} = \mu_{6\ months} = \mu_{1\ year} = \mu_{>1year}$

Ha: Mean Importance ratings over seven forecasting horizons are not equal i.e.

$\mu_{intraday} \neq \mu_{1week} \neq \mu_{1\ month} \neq \mu_{3\ months} \neq \mu_{6\ months} \neq \mu_{1\ year} \neq \mu_{>1year}$

Table 1-6. One Way ANOVA of Time Period

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5783.352	6	963.892	126.138	0.000
Within Groups	8077.151	1057	7.642		
Total	13860.503	1063			

A one way ANOVA was used to test the influence of Time Period (Hypothesis), on importance ratings in stock price forecasting.

Table 1-7. Robust Tests of Equality of Means-Time Period

	Statistic[a]	df1	df2	Sig.
Welch	120.722	6	469.203	.000
Brown-Forsythe	126.138	6	1009.821	.000

One way ANOVA of Time Period was found to be significant at p<.05, (F (6, 1057) = 126.138, p=.000). Welch test of Homogeneity of Variances was also found to be significant at p < .05, (Welch (6, 469.203) =120.722, p=.000) and Brown Forsythe test of Homogeneity of Variances was also found to be significant at p < .05, (Brown-Forsythe (6, 1009.81) =126.138, p=.000). These two tests say that variances among groups are Homogeneous.

As One way ANOVA of Time Period was significant, we then conducted Post Hoc Tests to find out between which pairs' of Time Period significance exists.

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the Intraday (M = 2.92, SD= 3.168) is statistically significant with respect to the 1Month (M =4.82, SD=2.812, p=.000), 3 Months (M = 5.74, SD=2.654, p=.000), 6 Months (M = 7.14, SD=2.437, p=.000), 1 Year (M = 8.54, SD=2.350, p=.000) and > 1 Year (M = 9.43, SD=2.666, p=.000). Comparisons between the Intraday and 1 Week was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the 1 Week (M = 3.25, SD= 3.152) is statistically significant with respect to the 1Month (M =4.82, SD=2.812, p=.000), 3 Months (M = 5.74, SD=2.654, p=.000), 6 Months (M = 7.14, SD=2.437, p=.000), 1 Year (M = 8.54,

SD=2.350, p=.000) and > 1 Year (M = 9.43, SD=2.666, p=.000). Comparisons between the Intraday and 1 Week was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the 1Month (M =4.82, SD=2.812) is statistically significant with respect to the Intraday (M = 2.92, SD= 3.168), 1 Week (M = 3.25, SD= 3.152, p=.000), 6 Months (M = 7.14, SD=2.437, p=.000), 1 Year (M = 8.54, SD=2.350, p=.000) and > 1 Year (M = 9.43, SD=2.666, p=.000). Comparisons between the 1Month and 3 Months were not statistically significant at p< .05.

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the 3 Months (M = 5.74, SD=2.654), is statistically significant with respect to the Intraday (M = 2.92, SD= 3.168), 1 Week (M = 3.25, SD= 3.152, p=.000), 6 Months (M = 7.14, SD=2.437, p=.000), 1 Year (M = 8.54, SD=2.350, p=.000) and > 1 Year (M = 9.43, SD=2.666, p=.000). Comparisons between the 3 Months and 1 Month were not statistically significant at p< .05.

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the 6 Months (M = 7.14, SD=2.437) is statistically significant with respect to the Intraday (M = 2.92, SD= 3.168, p=.000), 1 Week (M = 3.25, SD= 3.152 p=.000), 1Month (M =4.82, SD=2.812, p=.000), 3 Months (M = 5.74, SD=2.654, p=.000), 1 Year (M = 8.54, SD=2.350, p=.000) and > 1 Year (M = 9.43, SD=2.666, p=.000).

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the 1 Year (M = 8.54, SD=2.350) is statistically significant with respect to the Intraday (M = 2.92, SD= 3.168, p=.000), 1 Week (M = 3.25, SD= 3.152 p=.000), 1Month (M =4.82, SD=2.812, p=.000), 3 Months (M = 5.74, SD=2.654, p=.000), 6 Months(M = 7.14, SD=2.437,p=.000) and >

1 Year (M = 9.43, SD=2.666, p=.000).

Tamhane post-hoc comparisons of the seven forecasting horizons indicate that the > 1 Year (M = 9.43, SD=2.666) is statistically significant with respect to the Intraday (M = 2.92, SD= 3.168, p=.000), 1 Week (M = 3.25, SD= 3.152 p=.000), 1Month (M =4.82, SD=2.812, p=.000), 3 Months (M = 5.74, SD=2.654, p=.000), 6 Months M = 7.14, SD=2.437,p=.000) and 1 Year (M = 8.54, SD=2.350, p=.000)

Table 1-8. Overall Means of Time Period

Time Period	Overall Mean
Intraday	2.92
1 Week	3.25
1 Month	4.82
3 Months	5.73
6 Months	7.14
1 Year	8.53
> 1 Year	9.43

From overall means of seven forecasting horizons (Table-1. 8) it can be interpreted that at shorter horizons the skew is towar ds use of Pure Chartist Analysis and with increase in duration th e skew shifts towards use of Pure Fundamental Analysis.

Cluster Analysis

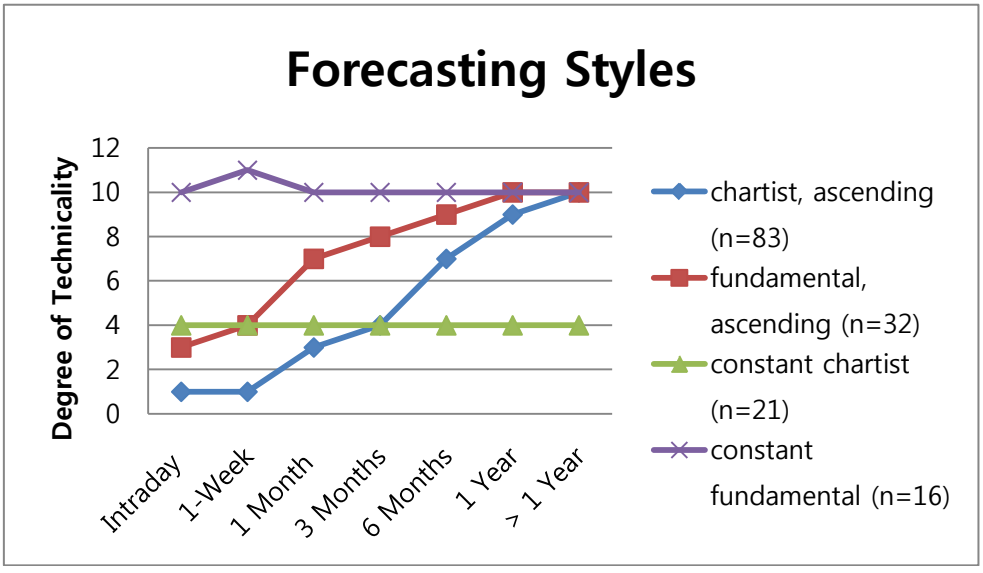
Brokers' overall forecasting approaches were determined by the mean value of their individual ratings given on the seven forecasting horizons. Cluster analysis was done to arrive at different classification of forecasting styles. This statistical method determines homogeneous groups of brokers using similar forecasting styles across the different time horizons examined. Cluster analysis is able to differentiate between brokers who

arrived at same mean value of ratings by the use of different forecasting styles across the seven forecasting periods.

A hierarchical cluster analysis using Ward's clustering method and squared Euclidean distance measures suggested a solution of four relatively homogeneous clusters of forecasting styles. Then k-means, non-hierarchical cluster analysis was conducted to divide brokers optimally into the four clusters. Chart 1.4 gives a picture of the four identified forecasting styles.

The largest cluster (54.60%) of brokers represents the forec asting profile termed 'chartist, ascending' which starts with a ver y technical (chartist) approach at intraday and 1 week forecasts (1 on the scale from 1= pure chartist analysis to 11= pure fundam ental analysis).

Chart 1-4. Forecasting Styles



The longer the forecasting period, the more fundamental this forecasting approach becomes, and brokers in this cluster progress to a purely fundamental forecasting approach in forecasting periods greater than 1 year (Mean=10 on the 1-11 scale). Brokers in the 'fundamental, ascending' cluster (21.05%) have a forecasting profile which looks like the 'chartist, ascending' profile described above. However, brokers in this cluster begin with a relatively more fundamental forecasting approach in intraday forecasts (Mean=3 on the 1-11 scale) and with increasingly longer forecasting horizons, apply a progressively more fundamental approach, ending with purely fundamental approach in forecasting horizons greater than 1 year (Mean= 10 on the 1-11 scale).

Brokers in the 'constant chartist 'cluster (13.81%) apply a constantly chartist forecasting approach across all time periods (Mean=4 over all forecasting periods on the 1-11 scale). The last category of brokers (10.52%) is termed as 'constant fundamental' apply a constantly fundamental forecasting approach across all time periods (Mean=10 mostly over all forecasting periods on the 1-11 scale).

Detailed analyses of these four forecasting styles and brokers' demographic variables show that like the overall chartism versus fundamentalism approaches, these forecasting styles do also not correlate with brokers' age($\chi 2=11.020$, $p=.527$), gender ($\chi 2=4.941$, $p= .176$) and experience($\chi 2=11.386$, $p= .250$).

OBJECTIVE 2-IMPORTANCE FACTORS' ANALYSIS ANOVA ONE WAY USING SPSS

Second objective of the current research was to investigate the importance of Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors,

Company Specific Factors and Other Factors on stock price forecasting in long term. Hence it was decided to conduct means test using one way ANOVA (Oberlechner, 2001). For this purpose, basing on the literature available, following hypotheses were set up and further tested.

Ho: Means of importance ratings of all Factors are equal i.e.

$\mu_{\text{Risk Factors}} = \mu_{\text{Liquidity Factors}} = \mu_{\text{Financial Factors}} = \mu_{\text{Technical Factors}} = \mu_{\text{Economic Factors.}} = \mu_{\text{Industry Specific Factors}} = \mu_{\text{Company Specific Factors}} = \mu_{\text{Other Factors.}}$

Ha: Means of importance ratings of all Factors are not equal i.e.

$\mu_{\text{Risk Factors}} \neq \mu_{\text{Liquidity Factors}} \neq \mu_{\text{Financial Factors}} \neq \mu_{\text{Technical Factors}} \neq \mu_{\text{Economic Factors.}} \neq \mu_{\text{Industry Specific Factors}} \neq \mu_{\text{Company Specific Factors}} \neq \mu_{\text{Other Factors.}}$

A one-way ANOVA was used to test the importance given to eight different factors: Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors, Company Specific Factors and Other Factors in stock price forecasting by brokers in long term.

Table 1-9. One way ANOVA of importance factors

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	155.102	7	22.157	37.915	.000
Within Groups	705.947	1208	.584		
Total	861.049	1215			

Table 1-10. Robust Tests of Equality of Means-Importance Factors Importance Rating

	Statistic[a]	df1	df2	Sig.
Welch	35.109	7	517.342	.000
Brown-Forsythe	37.915	7	1165.048	.000

A one-way ANOVA was used to test the importance given to eight different factors: Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors, Company Specific Factors and Other Factors in stock price forecasting in long term. The analysis showed significant difference across these eight factors at the $p<.05$, ($F(7, 1208) = 37.915$, $p = .000$).

Welch test of Homogeneity of Variances was also found to be significant at the $p < .05$, (Welch (7, 517.342) = 35.109, p=.000) and Brown Forsythe test of Homogeneity of Variances was also found to be significant at the $p < .05$, (Brown Forsythe (7, 1165.048) =37.915, p=.000). These two tests say that variances among groups are Homogeneous.

As one way ANOVA of importance factors was significant, we then conducted Post Hoc Tests to find out between which pairs' of importance factors significance exists.

Post Hoc Tests

Tamhane post-hoc comparisons of the eight factors indicate that the Risk Factor (M = 4.47, SD= 0.745) is statistically significant with respect to the Liquidity Factor (M = 4.09, SD=0.772, p=.000), Technical Factor (M = 3.73, SD=0.876, p=.000), Economic Factor (M = 4.03, SD=0.736 p=.000), and others (M = 3.53, SD=0.861, p=.000). Comparisons between the

Risk Factor and the other three factors: Financial, Industry Specific and Company Specific was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the eight factors indicate that the Liquidity Factor (M = 4.09, SD=0.772) is statistically significant with respect to the Risk Factor (M = 4.47, SD= 0.745, p=.000), Financial Factor(M=4.51, SD=0.661, p=.000), Technical Factor (M = 3.73, SD=0.876, p=.006), Industry Specific Factor (M = 4.40, SD=0.766, p=.011), Company Specific Factor (M = 4.52, SD=0.671, p=.000), and others (M = 3.53, SD=0.861, p=.000). Comparison between the Liquidity Factor and the Economic Factor was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the eight factors indicate that the Financial Factor (M=4.51, SD=0.661) is statistically significant with respect to the Liquidity Factor (M = 4.09, SD=0.772, p=.000), Technical Factor (M = 3.73, SD=0.876, p=.000), Economic Factor (M = 4.03, SD=0.736, p=.000), and others (M = 3.53, SD=0.861, p=.000). Comparisons between the Financial Factor and the other three factors: Risk, Industry Specific and Company Specific was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the eight factors indicate that the Technical Factor (M = 3.73, SD=0.876) is statistically significant with respect to the Risk Factor (M = 4.47, SD= 0.745, p=.000), Liquidity Factor (M = 4.09, SD=0.772, p=.006), Financial Factor(M=4.51, SD=0.661, p=.000), Economic Factor (M = 4.03, SD=0.736, p=.043), Industry Specific Factor (M = 4.40, SD=0.766, p=.000) and Company Specific Factor (M = 4.52, SD=0.671, p=.000). Comparison between the Technical Factor and the others was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the eight factors indicate that the Economic Factor (M = 4.03, SD=0.736), is statistically

significant with respect to the Risk Factor (M = 4.47, SD= 0.745, p=.000), Financial Factor(M=4.51, SD=0.661, p=.000), Technical Factor (M = 3.73, SD=0.876,p=.043), Industry Specific Factor (M = 4.40, SD=0.766, p=.001), Company Specific Factor (M = 4.52, SD=0.671, p=.000) and others (M = 3.53, SD=0.861, p=.000). Comparison between the Economic Factor and the Liquidity Factor was not statistically significant at p< .05.

Tamhane post-hoc comparisons of the eight factors indicate that the Industry Specific Factor (M = 4.40, SD=0.766), is statistically significant with respect to the Liquidity Factor (M = 4.09, SD=0.772, p=.011), Technical Factor (M = 3.73, SD=0.876, p=.000), Economic Factor (M = 4.03, SD=0.736, p=.001), and others (M = 3.53, SD=0.861, p=.000). Comparisons between the Industry Specific Factor and the other three factors: Risk, Financial and Company Specific was not statistically significant at p<.05.

Tamhane post-hoc comparisons of the eight factors indicate that the Company Specific Factor (M = 4.52, SD=0.671), is statistically significant with respect to the Liquidity Factor (M = 4.09, SD=0.772, p=.000), Technical Factor (M = 3.73, SD=0.876, p=.000), Economic Factor (M = 4.03, SD=0.736, p=.000), and others (M = 3.53, SD=0.861, p=.000). Comparisons between the Company Specific Factor and the other three factors: Risk, Financial and Industry Specific were not statistically significant at p< .05.

Tamhane post-hoc comparisons of the eight factors indicate that the Others (M = 3.53, SD=0.861), is statistically significant with respect to the Risk Factor (M = 4.47, SD= 0.745, p=.000), Liquidity Factor (M = 4.09, SD=0.772, p=.000), Financial Factor(M=4.51, SD=0.661, p=.000), Economic Factor (M = 4.03, SD=0.736, p=.000), Industry Specific Factor (M = 4.40, SD=0.766, p=.000) and Company Specific Factor (M = 4.52, SD=0.671,

p=.000). Comparison between the Others Factor and the Technical Factor was not statistically significant at p< .05.

Specifically our results suggest that Company Specific Factor was rated the most important (M = 4.52) and Others Factor was rated the least (M = 3.53) in stock price forecasting. (Greater the mean greater the importance attached (Table-4.59). Rest of the factors in the order of rating importance were Financial Factor (M=4.51), Risk Factor (M = 4.47), Industry Specific Factor (M = 4.40), Liquidity Factor (M = 4.09), Economic Factor (M = 4.03) and Technical Factor (M = 3.73).

Table 1-11. Means of Importance Factors

Importance Factor	Mean Value
Company Specific Factors	4.52
Financial Factors	4.51
Risk Factors	4.47
Industry Specific Factors	4.40
Liquidity Factors	4.09
Economic Factors	4.03
Technical Factors	3.73
Others	3.53

Taken together these results suggest that Risk Factor, Liquidity Factor, Financial Factor, Technical Factor, Economic Factor, Industry Specific Factor, Company Specific Factor and Others Factor do play important role in stock price forecasting even though intra-significance level is varying.

Table 1-12. Homogeneous Subsets of Importance Factors

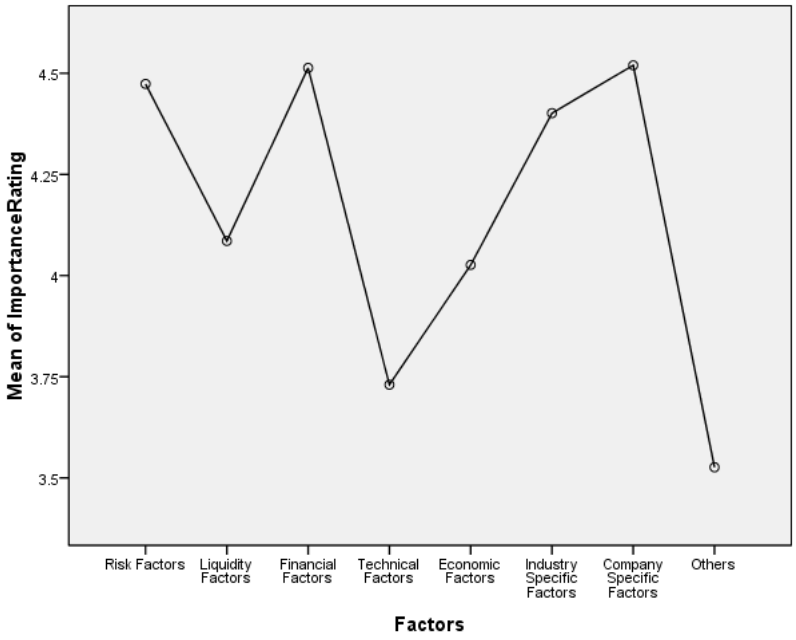
			Subset for alpha = 0.05		
	Factors	N	1	2	3
Tukey HSD[a]	Company Specific Factors	152	4.52		
	Financial Factors	152	4.51		
	Risk Factors	152	4.47		
	Industry Specific Factors	152	4.40		
	Liquidity Factors	152		4.09	
	Economic Factors	152		4.03	
	Technical Factors	152			3.73
	Others	152			3.53
	Sig.		.879	.998	.280

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 152.000.

Company Specific Factor, Financial Factor, Risk Factor and Industry Specific Factor gave significantly higher importance ratings than the Liquidity Factor, Technical Factor, Economic Factor and Others Factor. Liquidity Factor and Economic Factor gave significantly higher importance ratings than the, Technical Factor and Others Factor.

Company Specific Factors, Financial Factors, Risk Factors and Industry Specific Factors are grouped into one homogeneous set. Liquidity Factors and Economic Factors are grouped into one homogeneous set. Technical Factors and Others Factor are grouped into one homogeneous set.

Chart 1-5. Means Plot of Importance Factors



PRACTICAL IMPLICATIONS

These findings have some practical implications. First, as professional traders do not trade purely on the basis of the economic fundamentals, but also take into account market movements generated by other factors (noise trading), knowledge of technical analysis is important to anyone who would like to participate successfully in the stock market. Second, the existence of a skew towards reliance on fundamental analysis at longer horizons suggests that models based on economic considerations will be more important on the long run. Third, the existence of a skew towards reliance on technical analysis at shorter horizons

suggests that models based on short term considerations (noise) will be more important in the short term.

Fourth, the identification of different investment styles of brokers would help in understanding functioning of stock market better. Fifth, with respect to long term investment in the stock market, investors need to note that brokers pay special attention to company specific factors and financial factors.

CONCLUSIONS & RECOMMENDATIONS

Objective 1- Time Period

A one-way Analysis of Variance of Time Period to examine the importance that brokers' personally give to fundamental and technical analysis over seven forecasting horizons: intraday, 1 week, 1 month, 3 months, 6 months, 1 year and beyond 1 year reveal that Time Period did had a significant effect (Hypothesis testing, Table 1.6).

As one-way Analysis of Variance of Time Period was found to be significant (Hypothesis testing, Table 1.6), we then conducted Post Hoc Tests of Time period to find out between which pairs' of Time period significance exists. Post Hoc Tests of Time period was also found to be significant. Thus it could be interpreted that the importance that brokers' personally give to fundamental and technical analysis over seven forecasting horizons: intraday, 1 week, 1 month, 3 months, 6 months, 1 year and beyond 1 year is not the same. Brokers' rating differed depending on the forecasting horizon. From the overall means of seven forecasting horizons (Table 1.8) it can be interpreted that at shorter time periods (Intraday, 1 week and 1 month), there exists a skew towards reliance on technical analysis as compared to fundamental analysis, but as the length of time period increases (6 months, 1 year and > 1 year) the skew shifts to fundamental

analysis. This suggests that models that focus on fundamentals may perform poorly over short horizons because they miss the effect of technical analysis based decision on the market in the short period.

As professional traders do not trade purely on the basis of the economic fundamentals, but also take into account market movements generated by other factors (noise trading), hence it is recommended that knowledge of technical signals is important to anyone who would like to participate successfully in the stock market. It is also recommended that Technical analysis tools should be taught in Management Programmes along with fundamental analysis tools. The existence of a skew towards reliance on technical analysis at shorter horizons, suggest that models based on short term considerations (noise) will be more important in the short term hence, it is suggested that technical analysis should be used mainly for short term stock price prediction.

The existence of a skew towards reliance on fundamental analysis at longer horizons suggests that models based on economic considerations will be more important on the long run hence; it is recommended that fundamental analysis should be used mainly for long term stock price prediction.

Objective 2- Importance Factors

A one-way Analysis of Variance (Oberlechner, 2001) was conducted to test the importance given to eight different factors: Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors, Company Specific Factors and Other Factors in stock price forecasting by brokers in long term. The analysis showed significant difference across these eight factors (Hypothesis testing, Table 1.9).

As One way Analysis of Variance of importance factors

was significant, we then conducted Post Hoc Tests and found out that significance exists between different pairs' of importance factors. Thus it could be interpreted that brokers clearly perceive different factors differently. They gave more importance to few factors than others when they forecast stock prices in long term.

Company Specific Factors, Financial Factors, Risk Factors and Industry Specific Factors are grouped into one homogeneous set. Liquidity Factors and Economic Factors are grouped into one homogeneous set. Technical Factors and Others Factor are grouped into one homogeneous set (Table 1.12). Specifically our results suggest that Company Specific Factor was rated the most important and Others Factor was rated the least in stock price forecasting (Table 1.11). As company specific factors were rated as most important hence, it is recommended that investors need to look into company specific factors like quality of management, quality of audit report / auditors, bonus issues which effect the investment decision. As others factor was rated the least important hence, it is recommended that, the factors which investors need to concentrate less are political factors, astrology, dispersion of analyst forecast etc.

Company Specific Factor, Financial Factor, Risk Factor and Industry Specific Factor gave significantly higher importance ratings than the Liquidity Factor, Technical Factor, Economic Factor and Others Factor (Table 1.12). Liquidity Factor and Economic Factor gave significantly higher importance ratings than the, Technical Factor and Others Factor, (Table 1.12).

SCOPE AND LIMITATIONS OF THE STUDY

The first objective was to examine the importance that brokers' personally give to fundamental and technical analysis over seven forecasting horizons: intraday, 1 week, 1 month, 3 months, 6

months, 1 year and beyond 1 year. For this purpose researcher has conducted online questionnaire survey among corporate stock brokers registered with Bombay Stock Exchange in India only. Online survey was conducted for this purpose as the brokers were geographically distributed all over India and the cost and time involved in reaching them personally was huge. Attempt was made to understand the relative importance brokers attach to chartist/technical analysis versus fundamental analysis of stocks over seven forecasting horizons.

The second objective was to investigate the importance of Risk Factors, Liquidity Factors, Financial Factors, Technical Factors, Economic Factors, Industry Specific Factors, Company Specific Factors and Other Factors on stock price forecasting in long term. Attempt was made to understand the importance of the above factors that brokers take into consideration, while making investment in the stock market in long term.

The study was limited to only select approaches namely technical approach and fundamental approach and the study was limited to only select strategic factors. Another limitation of the study was economic conditions might have varied over time as the survey was taken quite some time to complete.

SCOPE FOR FURTHER RESEARCH

Further study can be done by comparing developed stock markets with emerging and developing stock markets across countries investigating the differences in usage of technical and fundamental analysis among different players in the stock market like Mutual Fund Managers, Brokers, Investment Bankers, Financial News Reporters, and Financial Analysts etc and also investigate other strategic factors which influence brokers decisions.

REFERENCES

Allen, H., and Taylor, M. P., Charts, Noise and Fundamentals in the London Foreign Exchange Market. The Economic Journal, 100(400), 1990, 49-59.

Bettman, J. L., Sault, S. J., and Schultz, E. L., Fundamental and Technical Analysis: Substitutes or Complements? Accounting and Finance, 49, 2009, 21–36.

Cheung, Y. W. and Chinn, M. D., Currency Traders and Exchange rate Dynamics: A Survey of the US Market. Journal of International Money and Finance, 20,2001, 439–471.

Cheung, Y. W., Chinn, M. D. and Marsh, I. W., How do UK-based Foreign Exchange Dealers Think Their Market Operates? International Journal of Finance and Economics, 9, 2004, 289–306.

Coakley, J. and Fuertes , A. M., Valuation Ratios and Price Deviations from Fundamentals. Journal of Banking & Finance, 30, 2006, 2325–2346.

Dornbusch, R., Expectations and Exchange Rate Dynamics. Journal of Political Economy, 84(6), 1976, 1161-1176.

Dornbusch, R., Exchange Rate Economics 1986. Economics Journal, 97, 1987, 18.

Edwards, R. D. and Magee, M., Technical Analysis of Stock Trends. Boston MA, 1967.

Fama, F. E., Random Walks in Stock Market Prices. Financial Analysts Journal, 1965.

Frankel, J. A. and Froot, K. A., Understanding the US Dollar in the Eighties: The Expectations of Chartists and Fundamentalists. Economic Record, Supplementary Issue, 62, 1986, 24-38.

Frankel, J. A. and Froot, K. A., Chartists, Fundamentalists and the Demand for Dollars. Greek Economic Review, 10 (1), 1988, 49-102.

Frankel, J. A. and Froot, K. A., Chartists, Fundamentalists, and the Demand for Dollars. Private Behaviour and Government Policy in Interdependent Economies, Oxford: Oxford University Press, 1990.

Goodman, S. H., Who's Better Than the Toss of a Coin? Euromoney, September, 1980, 80-84.

Kakani and Sundhar, Profiting from Technical Analysis in Indian Equity Markets: Using Moving Averages. XLRI Jamshedpur School of Business, 2006, 02-06.

Kakati, M., Stock Valuation Process-The Practioners' View. Finance India, 19(2), 2005, 513-523.

Keynes, J. M., The General Theory of Employment, Interest and Money. London: Macmillan, 1936.

Oberlechner, T., Importance of Technical and Fundamental Analysis in the European Foreign Exchange Market. International Journal of Finance and Economics, 6, 2001, 81-93.

Lo, A. W., Mamaysky, H. and Wang, J., Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation. The Journal of Finance, 2000, 4.

Lui, Y. H., and Mole, D. The Use of Fundamental and Technical Analyses by Foreign Exchange Dealers: Hong Kong Evidence. Journal of International Money and Finance, 17, 1998, 535-545.

Malkiel, B., A Random Walk Down Wall Street. New York: Norton, 1985.

Marshall, B. R., Cahan, R. H. and Cahan, J. M., Does Intraday Technical Analysis in the U.S. Market Have Value? Journal of Empirical Finance, 15, 2008, 199–210.

Meese, R., Currency Fluctuations in the Post-bretton Woods Era. The Journal of Economic Perspectives, 4(1), 1990, 117-134.

Menkhoff, L., The Noise Trading Approach -Questionnaire Evidence from Foreign Exchange. Journal of International Money and Finance, 17, 1998, 547-564.

Menkhoff, L., The Use of Technical Analysis by Fund Managers: International Evidence. Journal of Banking and Finance, 34, 2010, 2573–2586.

Mitra, S. K., How Rewarding is Technical Analysis in the Indian Stock Market? Quantitative Finance, 11, 2009, 287.

Murphy, J. J., Technical Analysis of the Futures Markets. New York: New York Institute of Finance, 1986.

Neely C. J. and Weller, P. A., Intraday Technical Trading in the Foreign Exchange Market. Journal of International Money and Finance, 22, 2003, 223–237.

Pampana, C. and Sahu, R., Application of Technical Trading Strategies in Indian Stock Market. Center for pbbefr.Rutgers, 2005, 20-37.

Pring, M. J., Technical Analysis Explained. McGraw-Hill, New York, NY, 1991, 2-3.

Sehgal, S. and Gupta, M., Tests of Technical Analysis in India. The Journal of Business Perspective, 11, 2007, 11-23.

Sharpe, W. F., Investments. Englewood Cliffs, NJ: Prentice-Hall, 1985.

Shiller, J. R., Irrational Exuberance. Broadway Books, New York, 2000.

Shiller, R. J., Fischer, S. and Friedman, B. M., Stock Prices and Social Dynamics. Brookings Papers on Economic Activity, 2, 1984, 457-510.

Shleifer, A. and Summers, L. H., The Noise Trader Approach to Finance. The Journal of Economic Perspectives, 4(2), 1990, 19-33.

Taylor, M. P. and Allen, H., The Use of Technical Analysis in the Foreign Exchange Market. Journal of International Money and Finance, 11, 1992, 304-314.

Wong, W. K., Manzur, M. and Chew, B. K., How Rewarding is Technical Analysis? Evidence from Singapore Stock Market. Applied Financial Economics, 2003.

Zhong, M., Darrat, A. F. and Anderson, D. C., Do US Stock Prices Deviate from Their Fundamental Values? Some New Evidence. Journal of Banking and Finance, 27, 2003, 673–697.

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Innovation Capabilities in Bio-Pharmaceutical R&D

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ABSTRACT

Innovation is the key to success for any organization and *distinguishes a firm from its competitors. Definitions of innovation vary by industries, as industrial features require distinctive innovation capabilities. This paper describes the bio-pharmaceutical industry's idiosyncratic issues, innovation-related challenges, success factors, and a close relationship between corporate strategy and innovation. Currently, the bio-pharmaceutical industry needs to be better equipped to handle current market factors including the influence of globalization and new drug laws. To reflect the industrial challenges, this paper contextualizes biopharmaceutical innovation and its success factors, and frames distinctive innovation capabilities by literature and theories. This paper contends that innovation*

capability consists of managerial capability and its strategic behavior

Keywords: Strategic management, bio-pharmaceutical industry, intellectual property, technology, knowledge, networking, collaboration, capability, innovation, management capability

INTRODUCTION

Generally, innovation can be defined simply as "the successful exploitation of new ideas" (DTI, 1994). Baumol (2002) said, innovation is "the recognition of opportunities for profitable change and the pursuit of those opportunities all the way through to their adoption in practice." Drucker (1994) said that "the best, perhaps the only, way a business can hope to prosper, if not survive, is to innovate." This conceptual paper argues that the definition of innovation differs across industries. Innovation is contextual concept; since innovation is " the development and implementation of new ideas by people who overtime engage in transactions with others in an institutional context" (Van de Ven, 1986). Hence, it is important for every industry to understand and develop their unique definition in order to generate optimum results. Each industry's own definitions of productivity lead to different and possibly unique ways of productive exploitation and hence different ways of innovation. With a focus specifically on the pharmaceutical industry, this paper illustrates distinctive managerial capability and its strategic behavior lead to distinctive innovation.

This paper contextualizes innovation in the bio-pharmaceutical R&D, where the most dynamic competition has occurred in terms of the industry's size, diverse knowledge-based

R&D sectors, and multiple other factors of success. The study begins by describing industrial issues and innovation-related challenges of the pharmaceutical industry. The next section discusses the recognized industrial success factors. A final section focuses on where the pharmaceutical industry's sources of innovation come from and why innovation has become the core capability that distinguishes a pharmaceutical firm from its competitors.

The pharmaceutical industry's claim to being the "most dynamic" environment stems from industrial issues:

- Diverse regulatory pictures in different countries;
- The growing demand for therapies among the aging populations of the OECD countries;
- Unpredictable demands on the industrial responsiveness due to outbreaks of SARS, avian flu, and so on;
- The industrial restructuring that has accompanied outsourcing to small drug discovery firms;
- The necessity to market not just to "end-users" (which is in any case illegal in many jurisdictions), but to physicians, insurers, and governments;
- The "blockbuster" drug phenomenon, in which a tiny fraction of a firm's drug portfolio account for the bulk of sales; and
- Many drugs now falling "off patent";

Parts of these are current industrial issues, which have been criticized from the economic perspective, e.g., expenditure and lengthy development time (DiMasi et al., 2001; DiMasi, 2002; DiMasi et al., 2003). Together, given the discontinuously changing turbulence level, these factors have led some writers to call for a new managerial model (Kim, 2012) or a new business models in the pharmaceutical industry (Bode-Greuel et al., 2009).

It is not profound to say that innovation must be central to a firm's strategy. However, due to the extreme turbulence of today's bio-pharmaceutical market, an especially tight connection between innovation capability and corporate strategy is called for in this industry. Therefore, this paper connects the idea of innovation capability to selected key elements of strategic theory.

Innovation must be preceded by the capability for taking action. Yet it seems fruitful to ask: Where does the capability for innovation come from, and what are its characteristics? Wishing to avoid circular logic, one cannot assert that a characteristic of innovation capability results in successful innovation. As a starting point, innovation capability involves (at the least) managerial capability and its strategic behavior to take risk of R&D projects – be they incremental or radical – and R&D activities that are highly uncertain. Figure 1 reflects the relationship between managerial capability, strategy, innovation capability, innovation, and success.

Innovation capability also implies that management has committed to taking innovative processes to implementation and innovative products to market (Baumol, 2002). By pursuing the goal of innovation, management strategically commits to identifying relevant innovation variables and success factors, to measuring the gap between the targeted innovation levels and the current state of affairs, and to marshaling available resources for R&D and commercialization. Without analytics, positioning the firm in the map of industry cannot be precise and the firm's innovation capability can be questioned.

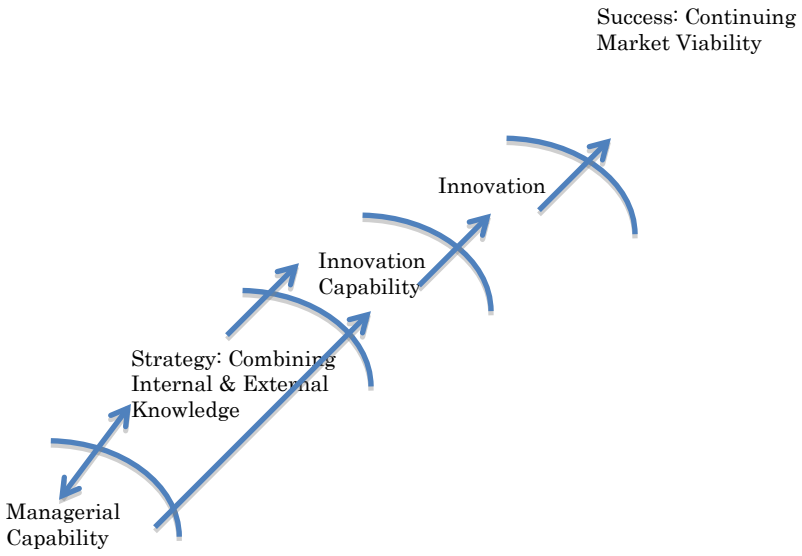

Figure 1: Relationship of strategy, capability, and innovation in pharmaceuticals.

HISTORICAL OVERVIEW & ENVIORNMENTAL FACTORS

An overview of the bio-pharmaceutical industry helps identify current variables associated with innovation. Historically, the bio-pharmaceutical industry has shown itself to be the most research driven and intellectual property driven industry. However, recently, bio-pharmaceutical industry players have come to reflect diverse knowledge sectors in terms of academic background, various biotechnology-based subfields, stricter government regulations, and markets that are more diverse in the era of globalization. These factors have all brought changes to the bio-pharmaceutical industry. When new biotechnology-based firms came into the industry, they brought changes and challenges by entry of new knowledge. The following overview

shows the importance of R&D in the bio-pharmaceutical industry and displays its relevant variables.

From 1850 to 1945, pharmaceutical products were produced by simple methods; the pharmaceutical industry provided pharmacists with the full range of chemicals that would go into doctors' prescriptions and research activities were limited. After the Second World War, the industry experienced a major breakthrough in terms of finding new methods for producing finished formulations derived from innovations. As a result, the industry became characterized by formalized in-house R&D facilities, rapid new drug discovery, and the emergence of global 'blockbuster' drugs (Gereffi 1983; Raggett 1996; Taggart 1993).

From the 1950s to the beginning of the 1990s, a range of products amenable to industrial manufacturing was discovered and entered the market. During this time, R&D investments leading to new patents were the entry barriers for companies wishing to gain the required level of international market reach. Biopharmaceutical R&Ds provided a key component to pharmaceutical industry success (Haakonsson, 2009).

Traditionally, large firms relying on their own chemical research (Allarakhia and Walsh, 2010) have dominated the pharmaceutical industry. In the late 1990's and beginning of the 21st century, the industry has expanded to include new knowledge from biology, nanotechnology, and bioinformatics, as well as chemical science (Newbert et al., 2009; van der Valk et al., 2009). In terms of knowledge domain, the pharmaceutical industry has become more complex than ever.

In addition to an increased knowledge sector, legal rewarding such as patents and market exclusivity has been significant industrial features to success. In the 1980's, well-known blockbuster model drugs targeted mass markets with a focus on prevalent diseases such as hypertension, lipid

metabolism disorders, and gastric ulcers. Good examples are enalapril, ramipril, cimetidine, ranitidine and especially atorvastatin (Lipitor), accounting for over $10 billion in annual sales (Bode-Greuel, Greuel, & Nickisch, 2009). While the legal protection provided by these types of patents ensures exclusivity in maintaining market shares of corresponding companies and avoiding knock-offs by competitors, legal regulation has played a big role in FDA (US Food and Drug Administration) approval requirements and has resulted in extended periods for approval and commercialization.

In 1996, the FDA granted patented products approximately 4.1 years of exclusivity, a peak amount granted in the industry. This number fell to approximately 2.1 years by 2001. Exclusivity is an exclusive regulatory marketing right granted by the FDA (under 21 C.F.R. 314. 108), which prevents generic products from entering the market. Additionally, new products take an average of 10-15 years to develop from initial discovery to final FDA approval (DiMasi, 2001). From 1988-2001, the average time the FDA took to approve a new drug was approximately 20 months (FDA, 2002). Over the same period, the cost of developing a new drug product increased from $231 million in 1987 to $802 million in 2000 (DiMasi, 2001).

On the other hand, new products or new chemical entities (NCE) are granted exclusively for a period of five years. It is important to note that exclusivity differs from traditional patent protection. By regulation, exclusivity can only be granted upon FDA approval of a new product, whereas traditional patents can be obtained at anytime during the discovery process. The pharmaceutical industry had a combined total of approximately 1,146 years of aggregate exclusivity protection in 1998. The exclusivity horizon had fallen to just over 800 years by 2001 and

the rate of decline has been rapid. The aging of the overall industry product profile is one reason for this rapid decline.

All of these legal regulation and protection have influenced the success product models in the pharmaceutical industry. While branded products with patent protection are still the main success product models (as mentioned above), there are now three types of product models today:

1. Branded products with patent protection (or blockbuster models), where the innovator has a monopoly on the product during the patent period.
2. Quality generics (off-patent products with international approvals, which may be sold under a brand but where equivalent products of the same quality are available).
3. Low-value generics (off-patent products sold mainly in developing country markets, where price is the determining factor setting the entry barriers for market access (Haakonsson, 2009).

Variables in Success Models

In pharmaceutical R&D, blockbuster product models have been traditionally the most profitable. However, declining productivity and upstart generic brands have caused management to reframe the success factors. Productivity has been due to FDA's approval rate and resulting "over-expenditure" on new product development.

Productivity has been declining since the late 1990s in terms of FDA's approval rate verses expiration rate of exclusivity protection. More drugs have been out of exclusive protection and fewer new drugs have been approved by the FDA (Higgins & Rodriguez, 2006). As R&D expenditures have risen in recent decades, marketing costs have increased in step. In 2004, the Big

Pharma companies spent almost double the amount on marketing that they did on R&D (Rangnekar, 2007).

From an economic perspective, drug discovery and development costs have become markedly high. The estimated average out of pocket cost per new drug is US $403 million (in year 2000 dollars). Capitalizing out-of-pocket costs to the point of marketing approval at a real discount rate of 11% yields a total preapproval cost estimate of US $802 million (in 2000 dollars) (DiMasi, Hansen, & Grabowski, 2003). Additionally, the entire drug development process is a very lengthy eight to twelve years (DiMasi et al., 2003), and additional drugs with total yearly sales of $170 billion will lose their patents by 2015 (Howells, 2008). These forces have led to increased alliances between "big pharma" companies and small, entrepreneurial drug discovery companies.

In 1999, there were 27 global blockbusters, of which seven had sales of more than US$2 billion. By 2004, the number had risen to 82, of which 34 exceeded US$2 billion in annual sales. The absolute bestseller product in 2006 (Lipitor by Pfizer, a cholesterol pill) earned over US$13 billion (IMS Health, 2007). However, this type of success product model tends to weaken by generic competitors when patents expire. For example, the market share of the blockbuster Prozac (an anti-depressive), first launched by Eli Lilly, declined by almost 75% within the first two months after patent expiry in 2002 (Kumar & Zaugg, 2003).

The pharmaceutical industry was led by vertically-integrated and technology-intensive transnational corporations (TNCs). With the implementation of the WTO TRIPs Agreement, the pharmaceutical industry was globalized, and its value chain was reorganized into three different strands: A producer-driven strand for branded products, a buyer-driven strand for quality generics, and a strand for low-value generics (Haakonsson, 2009).

Response to Challenges

Strategies of firms trying to deal with changes in the industry include the following.

1. Selling non-core business areas: Novo sold the Danish part of 'Ferring' and, furthermore, split into Novo Nordisk and Novozymes in order for Novo Nordisk to concentrate on high-value pharmaceuticals. Similarly, another Danish-based TNC, Leo Pharma, sold off its production of plastic and veterinary products in 2005 in order to focus entirely on human pharmaceuticals (Leo Pharma, 2006).
2. Concentrating core competency: Novo Nordisk is now looking into new therapeutic areas (cancer, blood) along with their core involvement in diabetes.
3. Increasing R&D externalization (Haakonsson, 2009).

The result of these environmental changes is pharmaceutical companies are focusing on their competitive capability to distinguish themselves from others. This is, also, the pharmaceutical firms' way of overcoming limited resources in a timely manner.

INNOVATION AND MANAGEMENT CAPABILITY

Innovation in the Biopharmaceutical Industry

In the bio-pharmaceutical industry, innovation is a key, core capability contributing to the firm's competitiveness (Howells, 2002). This is, first, because only innovative products and processes can win new, long-term legal protection through patents or market exclusivity. Notably, pharmaceutical innovation is rewarded by the FDA, based on novelty (new therapeutic entities) and usefulness (i.g.,orphan disease) (Aronson, Ferner, &Hughes,2012). Second, innovation capability goes beyond technical functionality to encompass managers' roles

in building internal R&D strength and searching out external R&D resources. In the pharmaceutical industry, innovation arises from a distributed and cumulative process of knowledge generation (Murray & O'Mahony, 2007).

In another aspect, innovation is characterized by high fixed costs, incurred over a period of years before any returns from the fruits of R&D (DiMasi, 2002). It is reasonable to assume that some innovation initiatives have proven to be dysfunctional, occasionally leading to catastrophic losses. (Yoffie & Cusumano, 1999). Herein, innovation capability refers to the managerial capability and its strategic behavior to generate new knowledge creation and do so effectively.

Definition of Innovation Capability

These views emphasize innovation as the utilization of knowledge based on interpretation of external information. Thus, innovation necessitates management capability of perceiving external variables and relating pertinent ones to the firm's internal productive resources and/or even external resources through collaboration. It follows managerial innovation capability, which is the ability to make connections between known internal research and less well-known external resources. This is only way to convert relevant variables into opportunities and knowledge into innovation, which is the core managerial innovation capability.

There have been new management models for innovation suggested by scholars: the "transition point model" (Allarakhia & Walsh, 2010), the new paradigm of the firm (Bessant & Francis, 2005), and the "design logic" (Elmquist et al., 2007), and "Efficient Innovation Managerial Model (EIMM)" (Kim, 2012). In practice, the Asian Cancer Research Group (ACRG) gained

special attention as open innovation research models: Weigelt (2009), Allarakhia & Walsh (2010), and Munos (2010).

On the other hand, there is a further need for new performance measurements of productivity for innovation – measures that do not discourage creativity. This assertion is based on 120 interviews with scientists in over 50 companies involved in the drug discovery process (Ullman & Boutellier, 2008). Thus, it is reasonable to start from conceptualizing an innovative pharmaceutical firm's 'innovation capability' as the key steps companies take to ensure early detection of relevant knowledge and even hidden knowledge.

Building internal strength and exploiting external knowledge and sources are what a firm desires to have, and what it has to choose, when faced with resource constraints. It is reasonable to assume that an innovative firm must generally possess 'innovation capability'– an underlying capacity to gain advantage by implementing more and better ideas than rivals (Coombs & Metcalfe, 2002). Innovation capability needs to support many seemingly conflicting situations: dealing with internal vs. external knowledge, with sustaining and disruptive technologies (Christenson, 1997), and prioritizing between operational efficiency and strategic movement toward innovation.

Managerial Capability Factors in Networking & External Collaborations

This section shows the connection between innovation capability and strategic bahavior. Networking and external collaboration were viewed as key strategic behavior for innovation by prior studies; Innovation has deep interconnectedness with intra- and inter-firm networking. Several studies show that managers who have joined or facilitated in an inter-firm or inter-network event carry out a

firm's internal innovation activities (White, Boorman, & Breiger,1976; Tushman, 1977; Allen & Cohen 1996, Brown & Duguid, 2001). Inter-organizational networking and capability of managing external collaboration were studied as key drivers of organizational and knowledge management. Powell (1998) studied these two circumstantial activities as dynamic and multi-level processes for acquiring and distributing new knowledge. Powell (1998) viewed external collaboration as a learning process of complexity and interaction, which tends to be involved with tacit knowledge and formal knowledge.

One way of measuring firm level capabilities is through the extent of experience a firm has in a specified area, in the sense that a firm learns over time how to use necessary resources in an increasingly efficient manner (Wang & Zajac, 2007; Anand &Khanna, 2000; Rothaermel & Deeds, 2004). There has been noticeable correlation, for example, between external collaboration experience and quality of collaboration. In other words, the more a firm enters into certain external collaborative types, the more prior external collaboration experience the firm has (Stephens, 2009). External collaboration experience influences decision-making and performance outcomes of external collaboration, which becomes a competitive advantage (Teece, Pisano & Shuen, 1997) when firms are considering entering new relationships (Wang & Zajac, 2007; Mahoney & Pandian, 1992). From this perspective, external collaboration capabilities improve with experience. Firm level capabilities refer to those competencies that a specific firm may have as a result of the ability to execute routines to effectively utilize resources within the firm (Nelson & Winter, 1982).

As Powell (1998) pointed out, due to the importance of the R&D task and/or its considerable expense, organizations in the biotechnology and pharmaceutical fields are rapidly developing

the capability to collaborate with a diverse array of partners to speed the timely development of new medicines. External collaboration capabilities have gained industry attention.

The present paper contends that there must be capability at the management level for relating knowledge or technology to innovative processes or products. This capability is evidenced by interpreting and decoding raw knowledge, technology, and tacit knowledge. This is referred to as managerial innovation capability. In the pharmaceutical realm, this has recently involved external collaboration. When there tends to be more sense of urgency, managers decide to do external collaboration, rather than building internal capability. External collaboration gives access to external knowledge, technology, and tacit knowledge, which are not available internally. In this sense, external collaboration needs strategic decisions from management, which may be a correlative of managerial capabilities and innovation.

Brown and Duguid (2001) proposed that the communication patterns among a firm's inventors influence its innovation activities (Paruchuri, 2010). When management can perceive and conduct the optimal external collaborations to gain the targeted key knowledge for the most preferred success models, this is management openness at the firm level. As previously mentioned, openness toward outsourcing is one success capability in the bio-pharmaceutical industry. Hence, the managerial openness is emphasized in this paper as an identifier of management cognitive flexibility toward external collaboration and new knowledge (Kim, 2012).

SUMMARY: UNIQUE INNOVATION CAPABILITIES IN THE BIO-PHARMACEUTICAL INDUSTRY

Bio-pharmaceutical innovation occurs in a context that involves high R&D costs, long product development cycles, heavy government regulation, and a very low ratio of the number of commercially successful drugs to the number of initial chemical possibilities and ideas. (This ratio is thousands to one, in contrast to about two hundred to one in fast-moving consumer goods such as foods and beauty aids.) The context also includes the high risk of unanticipated damage to the health of end-users, and the humanitarian demand for low-cost therapies in less-privileged geographies and populations. Additionally, in contrast to other industries, product sell-by dates may be short, and distribution and storage may require special handling and refrigeration. Special training may be required for the safe administration of the drug. These distinctive features place special demands on the innovation capability in the industry.

Bio-pharmaceutical innovation capabilities tend to be dynamically magnified through external collaboration (including outsourcing). External collaboration provides structured time and legal boundaries. First, this circumstance forces managers to efficiently identify and utilize emerging knowledge and technology resources (Howells, 2008). Second, external collaboration requires managers to interact with outsiders. In the context of bio-pharmaceutical R&D, the most intellectual property driven industry, external collaboration can take a hybrid form of open strategies toward external resources. Having external collaboration patterned in a firm becomes part of the innovation capability of the organization. Core capabilities of innovation stem from management capabilities of routinizing and

strengthening the firm's capabilities by aiming every operational decision toward the firm's innovation strategy.

When a firm is late getting to market, it will lose chances to have patents, licenses, exclusivity of monopoly, and competitive positioning over other competitors. Whether internalizing or externalizing R&D, managerial strategic mapping can take the firm to the preferred position at the preferred time. Therefore, innovation capabilities stems from, and is inseparably tied to, strategic management capabilities. In pharmaceuticals, these capabilities must include understanding and tolerance of the uncertainties of the R&D process, an orientation to external collaboration, a rather unique risk profile combined with a well-developed sense of medical ethics, and high personal and organizational flexibility.

This paper described the special characteristics of competition in pharmaceuticals, and established that a close connection between strategy and innovation capability – moderated by management development leading to management capability – is essential. This paper addressed academic attention to bio-pharmaceutical innovation capabilities, which are different and perhaps unique kinds and remain understudied, especially managerial capabilities.

This paper closes with a brief and somewhat more speculative discussion of the kind of strategic emphasis that might best serve this industry. The discussion draws on the work of Ansoff where he prescribes three dimensions of strategizing innovation: 1) identifying potentially unpredictable variables in the external environment; 2) formulating the preferred success model and determining key success factors; and 3) strategizing regarding capabilities, which is deciding whether to strengthen internal resources or exploit external resources. Utilizing these dimensions, management's vision can focus on the alignment of

all innovation-relevant resources toward the desired position in the strategic map (Ansoff & Mcdonnell, 1990). This "3-D" strategizing capability is found in Ansoff's strategic implanting, in which competitive positioning, real time issue management and change management are well dissected under an analytical microscope. These three dimensions of strategy tie a bio-pharmaceutical firm's innovating capacity to its intended purpose, making management capable of performing to the preferred success model.

REFERENCES

Allen, T. J. and Cohen, S. I., Information Flow in Research and Development Laboratories. Administrative Science Quarterly, 1969, 12-19.

Anand, B. and Khanna, T., How Entrepreneurial Firms can Benefit from Alliances with Large Partners, Academy of Management Executive, 15, 2000, 139-148.

Ansoff, I. and McDonnell, E., Implanting Strategic Management, Prentice Hall, New York, USA, 1990.

Allarakhia, M. and Walsh, S., Managing Knowledge Assets Under Conditions of Radical Change: The Case of the Pharmaceutical Industry, Technovation, 31, 2011, 105-117.

Aronson, J. K., Ferner, R. E., and Hughes, D. A., (2012). Defining Rewardable Innovation in Drug Therapy. Nature Reviews Drug Discovery, 11(4), 2012, 253-254. doi: 10.1038/nrd3715.

Baumol, W. J., The Free-market Innovation Machine: Analyzing the Growth Miracle of Capitalism, Princeton University Press, Woodstock, Oxon, USA, 2002.

Bessant, J. and Franicis, D., Targeting Innovation and Implications for Capability Development, Technovation, 25, 2004, 171-183.

Bode-Greuel, K. M., Greuel, J. M. and Nickisch, K., J., How can Pharmaceutical and Biotechnology Companies Maintain a high Profitability?, Journal of Commercial Biotechnology (August, 2009). 15(4), 2009, 309-323.

Brown, J. S. and Duguid, P. Knowledge and Organization: A Social-practice Perspective, Organization Science, 12(2), 2001, 198-213.

Christenson, C., The Innovator's Dilemma, Harvard Business School Press, Cambridge, MA, USA, 1997.

Coombs, R. and Metcalfe, S., Innovation in Pharmaceuticals: Perspectives on the Co-ordination, Combination and Creation of Capabilities. Technology Analysis & Strategic Management, 14(3), 2002, 261-271.

Diamond, J., Guns, Germs and Steel, Jonathan Cape, London, UK, 1997.

DiMasi, J. A., Caglarcan, E. and Wood-Armany, M., Emerging Role of Pharmacoeconomics in the Research and Development Decision-making Process, Pharmacoeconomics, 19 (7), 2001.

DiMasi, J.A. (2002). The value of improving the productivity of the drug development process: Faster times and better decisions, Pharmacoeconomics, 2002; 20 suppl. 3:1-10

DiMasi J. A., Hansen R. W. and Grabowski, H. G., The Price of Innovation: New Estimates of Drug Development Costs, Journal of Health Economics, 22, 2003, 151-185.

Department of Trade and Industry. Policy of the Department of Business, Innovation, and Science in the U.K. Website, 1994.

Drucker, P., Innovation & Entrepreneurship, Harper & Row, New York, USA, 1994.

Elmquist M. and Segrestin, B., Towards a New Logic for Front End Management: From Drug Discovery to Drug Design in Pharmaceutical R&D. Creativity and Innovation Management, 16(2), 2007, 106-120.

Gereffi, G., The Pharmaceutical Industry and Dependency in the Third World. Princeton, NJ: Princeton University Press, USA, 1983.

Haakonsson, S. J., The Changing Governance Structures of the Global Pharmaceutical Value Chain, Competition & Change, 13(1), 2009, 75-95.

Higgins, M. J. and Rodriguez, D., The Outsourcing of R&D through Acquisitions in the Pharmaceutical Industry, Journal of Financial Economics, 80(2), 2006, 351-383.

Howells, J. (2002), Mind the gap: information and communication technologies, knowledge activities and Innovation in the pharmaceutical industry, Technology Analysis& Strategic Management, 14 (3).

Howells, J., Gagliardi, D. and Malik, K., The Growth and Management of R&D Outsourcing: Evidence from UK Pharmaceuticals, R&D Management 38(2), 2008, 205-219.

IMS Health, Market structures, 2007.

Kim, H. R., Openness and strategic aggressiveness as R&D management capabilities in the context of bio-pharmaceutical industry, Alliant International University, ProQuest Dissertations and Theses, 185, 2012.

Kumar, P. and Zaugg, A. M., IMS Review: Steady but not Stellar. Medical Marketing and Media, 2003.

Leo Pharma, 2005 turned out to be a good year, Leo World, February, 2006.

Mahoney, J. T. and Pandian, J. R., The Resource-Based View

Within The Conversation Of Strategic Management. Strategic management journal, 13(5), 1992, 363-380.

Munos, B., Can Open-Source Drug R&D Repower Pharmaceutical Innovation?, Clinical Pharmacology and Therapeutics, 87 (5), 2010, 534–536.

Murray, F. and O'Mahony, S., Exploring the Foundations of Cumulative Innovation: Implications for Organization Science, Organization Science, 18(6), 2007, 1006-1021.

Nelson R. R. And Winter, S. G., An Evolutionary Theory of Economic Change, Cambridge, MA: Bellknap Press, 1982.

Newbert, S. L., Gopalakrishnan, S. and Kirchhoff, B. A., Looking Beyond Resources: Exploring the Importance of Entrepreneurship to Firm-Level Competitive Advantage in Technologically Intensive Industries, Technovation, 28, 2009, 6–19.

Phillips, F., The State of Technological and Social Change: Impressions, Technological Forecasting & Social Change, 78(6), 2011, 1072-1078.

Powell, W. W., Learning from Collaboration: Knowledge and Networks in the Biotechnology and Pharmaceutical Industries, California Management Review, 40(3), 1998, 228-240.

Paruchuri, S., Inter-Organizational Networks, Intra-Organizational Networks, and Impact of Central Inventors, Organization Science, 21(1), 2010, 63-80.

Raggett, T., GATT and Patent Reform: The Global Strengthening of Patent Protection and the Implications for the Pharmaceutical Industry, Financial Times Management Report (London: Financial Times Pharmaceuticals and Healthcare Publishing), UK, 1996.

Rangnekar, A., Longitudinal Study Of The Strategic Responsiveness of the Survivors of the Big Pharma in 1995

And 2004, Under Conditions of Consolidation in the Global Pharmaceutical Market, Unpublished Phd Thesis, NMIMS University, Mumbai, 2007.

Rothaermel, F. T. and Deeds, D. L., Exploration and Exploitation Alliances in Biotechnology: A System of New Product Development. Strategic Management Journal, 25 (3), 2004, 201-221.

Stephens, K. J., The Role of Capabilities in New Alliance Creation and Performance: A Study of the Biotechnology Industry. (Unpublished Doctoral Dissertation), University of Southern California, Los Angeles, CA, 2009.

Taggart, J., The World Pharmaceutical Industry, Routledge, London, UK, 1993.

Teece, D. J., Pisano, G., and Shuen, A., Dynamic Capabilities and Strategic Management, Strategic Management Journal, 18,(7), 1997, 509-533.

Tohidi, H. and Jabbari M. M., (2012) Innovation as a Success Key for Organizations, Procedia Technology, 1, 2012, 560–564.

Tushman, M. L., Special Boundary Roles in the Innovation Process, Administrative Science Quarterly, 1977, 587-605.

Tushman, M. L., Managing Communication Networks in R&D Labs, Sloan Management Review, 20, 1979, 37-49.

Ullman, F. and Boutellier, R., Drug Discovery: Are Productivity Metrics Inhibiting Motivation and Creativity?, Drug Discovery Today, 13, 2008, 21-22.

Van de Ven, A. H., Central Problems in the Management of Innovation, Management Science, 32(5), 1986, 590-607.

Van der Valk, T., Moors, E.H.M. and Meeus, M.T.H., Conceptualizing Patterns in the Dynamics of Emerging Technologies: The Case of Biotechnology Developments in The Netherlands, Technovation, 29, 2009, 247–264.

Wang, L. and Zajac, E. J., Alliance or Acquisition? A Dyadic Perspective on Interfirm Resource Combinations, Strategic Management Journal, 28(13), 2007, 1291-1317.

White, H. C., Boorman, S. A. and Breiger, R. L., Social Structure from Multiple Networks. I. Blockmodels of Roles and Positions, American Journal of Sociology, 1976, 730-780.

Weigelt, J., The Case for Open-Access Chemical Biology, EMBO Reports 10 (1), 2009, 941–945.

Yoffie, D. B. and Cusumano, M. A., What Netscape Learned from Cross-platform Software Development, Communications of the ACM, 42(10), 1999, 72-78.

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Banking System of Uzbekistan: Current State and Development Prospects

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ABSTRACT

In the article is considered the history of creation of a banking system of independent Uzbekistan, a way of its formation and a problem which the banking system faced. Besides it is told about successes, which were reached by a financial system of the republic and ways of the solution of the problems existing in the banking sector of the country are offered

Categories and Subject Descriptors: A.0 [Conference proceedings]

General Terms: Economics, Reliability, Experimentation, Security, Human Factors, Standardization, Languages, Theory, Legal Aspects, Verification.

Keywords: Banking system, Uzbekistan

INTRODUCTION

The last decade for Uzbekistan became some kind of "an era of changes". In the country are realized the full-scale reforms directed on formation of market multistructure economy (Akimov and Dollery, 2006; Park, 2006; Turk, 2010). The important role is played here by creation of the strong and stably developing banking sector. The period of independence became for the banking sector of the country the transition period from a monobanking system to creation new, meeting the requirements of market economy, the modern banking sector, formation of system of universal banks (Moiseev, 2008).

BANKING SYSTEM IN UZBEKISTAN

Creation of a modern banking system took place in Uzbekistan step by step. Uzbekistan didn't try to force process of liberalization of the banking sector, placing emphasis on quality and timeliness of carried-out reforms (Kotljarov, 2008; Ruziev and Ghosh, 2009).

The initial stage of reforming was connected with implementation of a number of the measures directed on formation of bases of a banking system. Acceptance in 1991 of the Law of the Republic of Uzbekistan "About banks and bank activity" became a basis for creation of a two-level banking system (Gürgen, 1999; Stolyarenko, 2006).

According to this law was created the independent Central bank of the country to which problems of regulation of monetary circulation, formations of system of commercial banks, and also creations of payment system were assigned. For performance of these qualitatively new tasks which are cardinally differing from former, in the Central bank were created the divisions

responsible for development and realization of monetary, credit and currency policy, regulation and supervision of bank activity, development of system of calculations and payments. Created specialized commercial banks which started development of strategy of the development and formation of the internal divisions should carry out financing of various branches of economy now (Allen, 2007).

Introduction in the address at the end of 1993 of sum-coupons as intermediate currency, and since July 1, 1994 - high-grade national currency – sum, became an important milestone in formation of an independent banking system. From now on the Central bank became completely independent in the actions which were directed, first of all, on effective creation of national monetary system with market instruments of its regulation. Exactly from now on activity of the Central bank in areas of development and carrying out a monetary policy and currency regulation, regulation of bank activity and creation of effective payment system was completely directed on ensuring stability of national currency (Fries and Taci, 2002).

Necessary conditions for formation of the competitive environment in the credit and depositary markets and also improvements of quality of service of the population were at the same time created. After the situation cancellation, limiting the sum of involved savings of the population in volume of own capital of bank, possibilities of banking institutions essentially extended and even more the competition in this market amplified. Results didn't keep itself waiting: if at the beginning of 1994 of 98,5 % of savings the population which are storing in a banking system, fell to the share Savings (present National) bank and on other banks – 1,5 %, already by the end of the same year a share of other commercial banks reached 12,8 %. Today this indicator makes 83 % (Khalmurzaev, 2000).

High-quality updating of the legislative base which basic provisions correspond to the international bank practice became the beginning of the following stage. The parliament of the country adopted two laws: "About the Central bank of the Republic of Uzbekistan" and "About banks and bank activity". By their development experience of the countries with the developed financial systems was considered. It agrees to the first of them the Central bank of the Republic of Uzbekistan became full body of monetary regulation and bank supervision. The second law accurately defined subjects of bank activity and all legal aspects of functioning of the second level of a banking system – commercial banks. In this law were put the legal bases necessary for formation of universal commercial banks on the basis of a diversification of bank assets and attraction of the foreign capital in a banking system.

At this stage the attention was also paid to further improvement of the mechanism of calculations and creation of modern system of electronic payments, providing banks with the computer and telecommunication equipment. Understanding all importance of this work the Government took a non-standard step having released banks from payment of a number of taxes with the direction of these funds for the above-stated purposes. It allowed for short term, in one and a half years, to create practically "from scratch" modern interbanking electronic system of payments (Jha, 1999).

The tax privileges provided to banks, allowed to create also National information base of bank depositaries - multi-purpose system of creation, storage and updating of information on all clients of banks. One of her users is the credit bureau interested in data collection about a financial condition and credit history of borrowers, allowing to lower credit risk. Thanks to the accepted measures for automation and a computerization of a banking

system of the country it is created not only a complex of information systems and the local programs used for internal needs of bank, but also the complete national system providing financial activity of all state.

With a view of ensuring openness of a banking system for clients and the general public, continuation of works on creation in banks of modern information systems development and introduction of new system of accounting was begun. Specialists of the Central bank in close cooperation with experts of the most known consulting companies of the world for less than three years developed and entered into practice new books of accounts and accounting system for the banks, corresponding to the International Financial Reporting Standard. Economic value of introduction in practice of such forms of the reporting providing openness of information on bank activity is huge. Banks obtaining available funds of clients and investors, finance the enterprises and businessmen or invest them in the financial market. Thereof banks bear high social obligations. Besides transfer of accounting to the international standards allows to use modern bank technologies and most to automate bank operations (Bartlett, 2001).

Dynamic development of bank audit became other, not less important direction of transformations in a banking system of the country in this period. In 1997 at the initiative of the Government and the Central bank was begun audit of leading commercial banks of the country by the world famous auditor companies. As a result received qualitative audit reports allowed to estimate objectively strong and weaknesses of activity of leading commercial banks of the republic and to accept the corresponding steps to the direction of further increase of competitiveness of our banks, achievements of the international standards by them.

Problems of the following stage of development of a

banking system became attraction of the private capital to the bank sphere, increase of level of corporate governance in joint stock banks and further improvement of system of supervision over banks.

Inflow of the private capital to this sector of economy became one of the strategic directions of transformations in the bank sphere at this stage. This process became more active with an exit in 1997 of the relevant Decree of the President of the republic providing a number of privileges and incentives for opening of private banks. Growth of number of the last reflects the great interest shown by a private sector to the financial market of the country. It positively affects developments and stimulations of the enterprises of small and medium business.

Along with attraction in the banking sector of the private capital, measures for further strengthening of a corporate management system by banks were taken, in compliance with which concrete actions for increase of a role of shareholders and councils of banks in their management, to high-quality improvement intra bank audit services were carried out.

For increase of efficiency of a banking system the Central bank directed the efforts to further improvement of system of bank supervision along with creation of internal mechanisms of self-regulation. For performance of this task on a basis of "Principles of effective bank supervision" Basel committee on bank supervision, the internal normative documents regulating bank activity were completely processed. Along with it, systems of computer remote monitoring behind activity of banks and inspections of banks on places according to international and recognized system CAMEL were introduced. The essential help was rendered in this case by the World Bank (WB) and Agency on the international development of the USA (USAID) (Rustem, 2008).

Occurred in the second half of the 1990th years financial crises in a number of the countries and regions of the world increased the importance of these projects and served definition of accurate reference points in its reforming. Methods of implementation of remote supervision and inspection on places were as a result reconsidered, the structure of service of bank supervision is optimized, are processed operating and the new normative documents establishing detailed requirements to conducting of bank activity and its regulation are developed.

Acceptance of a number of requirements for the minimum size of authorized capitals of commercial banks, to the maximum share of one shareholder in authorized capital of bank, mutual participation of commercial banks in authorized capitals of each other, privatization of banks and another became a logic step to the direction of strengthening of bank supervision.

By the end of the 1990th in the country comprehensively steady banking system was created, modern bank supervision corresponding to the international standards effectively functioned, the mechanism of regulation of bank activity was adjusted. At the same time, the role of a banking system in ensuring sustained economic growth did necessary, along with creation of effective bank supervision and system of regulation of bank activity, its further liberalization and deepening of reforms which should strengthen trust to all bank sphere and create necessary conditions for transformation of banks into original financial intermediaries. It demanded increase of financial stability of banks and level of their capitalization at the expense of attraction of means of new shareholders, a diversification of forms of ownership in a banking system, competition stimulations in this sector of economy, improvement of system of electronic payments, developments of effective information systems and to increase of technical equipment of banks by use of the modern

equipment and means of communication (Vakhabov and Bobakulov, 2009).

Along with the microeconomic measures which are positively influencing efficiency of development of a domestic banking system, as one last macroeconomic factors promoting activity of banks, liberalization of the currency market and creation of necessary conditions on ensuring convertibility a bag on the current international operations acts. The measures taken in this area allowed the Republic of Uzbekistan to accept since October 15, 2003 obligations according to sections 2 (and), 3 and 4 Articles VIII of Articles of the Agreement of the International Monetary Fund. It is important to note that Uzbekistan achieved this objective first of all, leaning on own resources, without attraction of external loans. Thus were not only are kept but also volumes of gold and foreign exchange reserves of the republic are considerably increased.

Ensuring convertibility of sum on the current international operations and adoption of the corresponding obligations development of the new bill of the Republic of Uzbekistan "On currency regulation" in which remarks and proposals of experts of the International Monetary Fund were considered demanded. With adoption of law at December session of parliament in 2003 the national legislation on currency regulation is brought into accord with the international practice and provisions of Article VIII of Articles of the Agreement of IMF.

Now with full confidence it is possible to argue that the system of supervision created in Uzbekistan behind banks and their inspections corresponds to practice of the central banks of the developed countries.

Need of strengthening of a number of institutional bases of functioning of a banking system and system effectiveness increase as a whole predetermined acceptance in recent years a

number of the program documents directed on liberalization and reforming of a banking system. Thus are put in a basis of documents the systematic and a step-by-step approach to liberalization of bank activity. It should be noted that commitment to these principles loss of trust of the population to domestic banks that was observed in a number of the countries with transit economy allowed Uzbekistan to avoid. It is big success in business of creation of a stable and reliable banking system and serves as the base for further transformations of a financial system.

CURRENT STATE OF BANKING SYSTEM IN UZBEKISTAN

Today in front of Uzbekistan there is a problem of creation of the effective banking sector with modern bank infrastructure. The realized program of reforming of a banking system determines the main directions of its liberalization by a way of activization of process of privatization of banks, attraction to the capitals of banks of additional foreign and domestic investments, further commercialization of their activity, expansion of access of enterprise structures to bank financing and trust increases to banks from investors.

In medium-term prospect two main strategic objectives which will define development of the banking sector of Uzbekistan are defined. Firstly, increase of financial stability of banks and expansion of a range of financial services in domestic market. Secondly, activization of banks of Uzbekistan in the international market of the capital. All these measures, certainly, testify to aspiration and readiness of the country for integration into being globalized world economy.

From the point of view of internal aspect the main attention will be given to strengthening of a financial condition of

viable banks and removal from the market of problem banks, to increase of level of capitalization of banks and qualities of the capital, expansion of the range of bank services, and also to strengthening of interaction of banks with real economy, to finishing of indicators of development of the banking sector of Uzbekistan to the international standards.

From the point of view of the international aspect in the long-term plan it is necessary to join really a world banking system, i.e. to act not only as her borrowers, and to become full participants of the international currency and credit relations.

The good precondition for this purpose is that circumstance that a banking system of Uzbekistan on the key qualitative parameters (the share of the capital and assets of a banking system in gross domestic product (GDP) belongs to the leading countries in group of transit economy.

Already now it is possible to declare firmly that for years of reforms in the country the modern banking system which promotes national economy development is created. Now the banking sector of Uzbekistan is presented by the Central bank and 33 commercial banks from which 3 banks are the state, 5 banks - with participation of the foreign capital, 12 banks – with prevalence of the private capital and 13 banks – with the mixed forms of ownership.

There is developed a number of the directions of its reforming with a view of further development of a banking system, proceeding from strategy of liberalization of economy.

DEVELOPMENT PROSPECTS

The important direction of changes in the banking sector are processes of restructuring and privatization of the state banks. In this context the main problem is the organization of effective and

optimum sale of a part of the state share in commercial banks of the republic domestic and to foreign investors. In 2003 the state has realized the shares in authorized capital of five commercial banks such as Tadbirkorbank, Trastbank, Savdogarbank, Aviabank and Ipak Yuli bank. In the current year are planned foreign trade activities National bank and Osaka bank privatization. From that privatization of the banking sector will be how successfully realized, the course of reforms carried out in the country in many respects depends. Therefore here it is necessary to allocate care and a progressive actions of Uzbekistan in the course of the solution of this task.

Now is studied the number of questions which decision will allow to prepare more effectively separate commercial banks for incorporating or restructuring of authorized capital of already incorporated banks. Change of structure of management by bank, bank estimation of cost, optimum distribution of shares, an assessment of quality of a portfolio of assets and restructuring of assets belong to such questions.

This work is conducted by specially created Bureau on privatization of banks which works in close contact to the State committee on management of the state property and business support. For search of the potential foreign investors, capable to gain a share in authorized capital of commercial banks (first of all, the largest banks of the republic - National bank of foreign economic activity and Osaka bank) consultations of a number of the international financial institutions are carried out. It is possible to note that authoritative international banks expressed interest to participation in privatization of banks of Uzbekistan that confirms appeal of assets of this sector of economy.

Involvement of investors is of great importance not only for budget replenishment from sale of state ownership, but also for increase in the capital of commercial banks. Thus the special

emphasis becomes on involvement of foreign strategic investors

Answering calls, banks become in a sense "locomotives" and for all financial sector of the country. Banks expand a set of offered services, let out new bank products on the market and actively generate the international standards of activity of financial institutions which then smoothly accustom other financial institutions of the country.

Development of a network of new banks with fully private capital is other priority direction in reforming of the banking sector of Uzbekistan. The government and the Central bank in every possible way stimulate development of private banks. So, them give a technical support in personnel preparation appears tax and other privileges. Now the number of private banks makes about a half from total number of commercial banks of the country. Stimulation of development of private banks in the republic promoted competition increase, improvement of quality of provided bank services, effective market distribution of financial resources. It should affect positively developments and stimulations of private business in the country.

It should be noted that provided in strategy of reforming of the banking sector of action for development of the competitive environment assume further expansion of a network of banks and their branches, stimulation of creation of new banks in regions of the country, etc.

Competition development in the financial market also is promoted by opening of banks with participation of the foreign capital. Today the foreign capital participates in five banks of the republic. The important role in the course of competition increase in domestic market is played by the Central bank which encourages inflow of the foreign capital on the financial market of the republic. We recognize that in the short term strengthening of a role of banks which are supervised by the foreign capital is

represented desirable. Inflow of the western capital is necessary as in itself and from the point of view of introduction on domestic market of the modern bank technologies, new financial products and culture of banking as a whole and also the catalyst of the competitive environment in the financial market of the country that positively influences quality of services rendered by bank. The role which has increased in recent years of foreign trade in national economy and also the introduction of Uzbekistan in the short term in the World Trade Organization allow to say that process of creation of banks with participation of the foreign capital becomes more active.

Considerably work of banks on attraction of lines of credit of the international financial organizations, including for implementation of programs on support of small and medium business became more active. Today is conducted work on implementation of the above-stated programs cooperation with the European bank of reconstruction and development, Asian Development Bank, International financial corporation, Credit agency of development of Germany, banks of the USA and Japan. Growth of attraction of the credits without granting guarantees of the government became unconditional achievement. It proves reforms carried out in the country and gives confidence of business of liberalization of economy as a whole and the banking sector in particular.

Already now it is possible to feel effectiveness of carried-out reforms. The carried-out work considerably raised possibilities of banks in the field of crediting and activization of investment processes. So, only at the expense of foreign lines of credit are realized more than 200 investment projects on development of subjects of small and medium business, private enterprises, joint-stock companies and the agricultural enterprises.

Other direction of increase of efficiency of banks and competition strengthenings in the banking sector is process of consolidation of banks. In recent years in the republic there were 6 reorganization of small banks by their voluntary merge or absorption by their larger banks. It is rather new tendency in the banking sector of the country but reflects the processes occurring in world bank community.

A number of merges and acquisitions positively affected both operating activities of separate banks, and on strengthening of a banking system as a whole, at the expense of increase of stability of banks. Interest of banks in these processes speaks in, the first stage, aspiration to raise the competitiveness in the market and to increase resource base, and also to cut management and operating expenses.

Along with consolidation of the banking sector, the importance has increase of level of the competition in the financial market. Special significance is for this purpose attached to creation of non-bank financial institutions, in particular, the credit unions. The effective legislative and standard and legal base of activity of the credit unions is so far created. In different regions of the republic function 14 such financial intermediaries. Creation of the credit organizations alternative to banks substantially promotes satisfaction of requirement for financing of the enterprises of small and medium business, especially those from them which are at the initial stage of the development or conduct the activity in the remote rural areas.

The great attention is given to increase as a whole trust to a banking system where special value is given to a question of trust of the population to banks. The world practice shows that introduction of system of guaranteeing deposits of citizens in banks on a legislative basis positively influences increase of their trust to a banking system therefore the volume of personal

savings grows in banks. For this reason in 2002 the parliament of the country passed the Law "About guarantees of protection of deposits of citizens in banks". It allowed to create the reliable and effective mechanism of protection of deposits of the population in banks.

With a view of further increase of trust to a banking system from the public and legislative ensuring secret of bank operations in 2003 the Law "Was passed about bank secret". Importance of this Law is defined by that establishes an accurate order of granting and receiving the data making bank secret, and is directed on prevention of illegal intervention in activity of managing subjects from the third parties. By its development were most considered the interests of the citizens, managing subjects, features of social development of the country, and also experience of functioning of institute of bank secret of many foreign states.

Commercial banks of Uzbekistan, except performance of the classical functions, are active participants in stock market. In recent years with a view of increase of the competitiveness they considerably stirred up the activity on this quickly growing segment of the financial market.

At the first stages of formation of stock market of Uzbekistan the main attention of banks was turned on issue and investment activity that provided with it receipt of cheap financial resources and increase of level of capitalization and also profit extraction at the expense of growth of a course stock value or obtaining the steady income on the

In process of building of turns on national securities market commercial banks become one of most his active institutional participants. They purposefully expand volumes of issue activity, types of made operations and the range of rendered services.

As the proof activity of banks in the market of the corporate bonds which active development can be observed within the last years can serve the aforesaid. An appearance of new financial instruments allows banks to act not only as issue and investment structures but also as main "players" on the whole range of financial transactions.

Complication of financial operations also it is respectively brave in the financial markets, demand adequate improvement of supervising functions of the Central bank. Maintenance and strengthening of effective supervision of activity of commercial banks from the Central bank remains an important task at this stage of development. In recent years we are witnesses of growing financial and economic interdependence of the countries and the whole regions of the world. Bank business takes leading positions in the course of globalization. The world market of the capital which has become a core of this process, is already quite tangible reality for managing subjects of the republic, including commercial banks..

The experience of recent financial crises once again reminded bodies of bank supervision that their main function consists not in application of these or those sanctions to the banks which have not fulfilled certain requirements for standards and limits and in preservation of stability of a banking system as a whole in order to avoid financial shocks. Exactly proceeding from these reasons supervising functions of the Central bank it was initially constructed as "early warning system".

Along with questions of bank supervision, the considerable attention is given to right application strengthening in the field of control of currency transactions, observance of the tax and antitrust law in the bank sphere, laundering of illegally received income.

The important direction of reforms which is carried out by

bodies of supervision – ensuring transparency of banking institutions. Providing of external audit by the auditor companies recognized in the world allows potential domestic and foreign investors to obtain confirmation of reliability of the bank reporting and its compliance to the established standards of accounting. The requirement for the regular publication of financial statements allows the general public to make with higher quality an activity assessment this or that of bank.

Thanks to accepted measures commercial banks of the republic become more attractive to foreign investors. Heightened interest of the authoritative international organizations in banks of Uzbekistan became fruits of carried-out work. It testifies that they enjoy confidence not only within the country, but also beyond its limits. It is possible to argue safely that the banking sector of our republic becomes more attractive to world financial community.

Considering that recently interest to the arising markets (emerging markets) again began to raise, it is possible to assume activization of activity of foreign investors in this sector of economy of Uzbekistan.

As a result of liberalization and deepening of reforming of a banking system the main indicators characterizing its condition, had positive dynamics.

Despite essential achievements in the field of reforming, we should realize clearly that the economic growth which was observed in the country demands more dynamic development of financial infrastructure,

first of all, a banking system. And though at present the general condition of the banking sector as a whole answers the current level of development of economy, progress is still insufficient.

Today before bank community of Uzbekistan there are

many difficult tasks but the prospect of development of this sector is represented very optimistical. It is natural that so necessary development of a banking system won't occur in itself, and will be result of increase of efficiency bank business, its further liberalization which will create a real basis for ensuring steady growth of all economy.

REFERENCES

Akimov, A. and Dollery, V., Uzbekistan's Financial System. An Evaluation of Twelve Years of Transition, Problems of Economic Transition, 48(12), 2006, 6-31.

Allen, M. A., The Banking System as an Institution of the Market Economy, Banking, 2007, 2-8.

Bartlett, D. L., Economic Recentralization in Uzbekistan, Post-Soviet Geography and Economics, Taylor & Francis, New York, USA, 2001.

Fries, S. M., Taci A. Banking Reform and Development in Transition Economies, IDEA, Missouri, USA, 2002.

Gürgen, E., Economic Reforms in Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan, International Monetary Fund, Washington DC, USA, 1999.

Jha, J. D., Money Matters: Restructuring Banks in CIS, Economic and Political Weekly, 34(27), 1999. 1756-1758.

Khalmurzaev, N. A., Small and Medium-sized Enterprises in the Transition Economy of Uzbekistan: Conditions and Perspectives, Central Asian Survey, Taylor & Francis, New York, USA, 2000.

Kotljarov, M. A., The National Banking System as Part of the Sovereignty of Russia, Banking , 2008, 56-59.

Moiseev, S. R., Why do We Need a Central Bank?, Banking, 8,

2008, 40-46.

Park, Y. C., Regional Financial Integration in East Asia: Challenges and Prospects, Regional Financial Cooperation, Brookings Institution Press, Washinton DC, USA, 2006.

Rustem, M., The Crisis in Financial Markets and New Challenges for Banking Regulation and Supervision, Banking, 3, 2008, 33-39.

Stolyarenko, V. M., The Central Bank and Its Role in the Economy of the Country, Moscow: Higher School of Economics, 2006.

Ruziev, K. and Ghosh, D., Banking Sector Development in Uzbekistan, Problems of Economic Transition, 52(2), 2009, 3-41.

Turk, A. R., On the Implications of Market Power in Banking: Evidence from Developing Countries, Journal of Banking & Finance, 34(4), 2010, 765-775.

Vakhabov, A. and Bobakulov, T., Uzbekistan's Banking System and Its Role in Implementing the Anti-Crisis Program, Central Asia and the Caucasus, CA&CC Press, Sweden, 2009.

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