A Sector Analysis for RFID Technologies: Fundamental and Technical Analysis for Financial Decision Making Problems

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1. Introduction

Automatic identification technologies have been used in a wide range of applications for reducing the amount of time and labor needed to input data and improving data accuracy. As an important automatic identification technology, radio frequency identification (RFID) technologies allow contactless reading and these technologies are particularly successful in manufacturing and other environments where traditional identification technologies such as bar codes can not perform well. By integrating the RFID technology into their business models, companies may save time, lower labor cost, improve products quality and provide better service. RFID is the wireless technology that uses RF communication to identify, track and manage objects and collect and store data. RFID technology enables companies to develop applications that create value by tracking and identifying objects, animals or people. Business applications of RFID technology can be seen in areas such as manufacturing, supply chain management, software integration, security systems, asset tracking and many others.

RFID technology was predicted to be one of the "top ten" technologies in 2004 by CNN. Although, the RFID market is less than five years old, it has been applied to many different industries, from retail industry to logistics, or from healthcare to service business industry – and it is still growing. Particularly, RFID has fundamental influences on today's retailing and supply chain management for applications like asset tracking, the inventory control and management. RFID technology also finds major application in mobile phones and is widely used in toll collection of highways, for payments in restaurants, vending machines, retail and parking lots. There are a wide range of RFID systems currently being used or being developed. Examples to these systems include but not limited to the following; automatic vehicle and personnel access control for security (Simpson, 2006), airport passenger and baggage tracking (Ferguson, 2006), tracing blood for cutting down errors such as giving patients wrong blood types (Ranger, 2006), payment process systems (Ramachandran, 2006), production control in manufacturing (Liu & Miao, 2006), transfusion medicine (Knels, 2006) real-time inventory control by automated identification of items in warehouses, tracking and management of physical files, tracking of books in the libraries (Shadid, 2005). For some other applications, interested reader is referred to (Finkenzeller, 2003; Smith, 2004).

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RFID solution providers claim that their technology and solutions bring significant benefits and have valuable advantages in practice. As new RFID solutions being developed and more RFID tags and equipments being used, these solutions will become more cost effective and RFID businesses are expected to grow rapidly. Since RFID is fairly new, it's difficult to measure resulting sales increases or heightened customer satisfaction quotients. On the other hand, according to IDC estimation (IDC is a subsidiary of International Data Group, a leading technology media, research, and events company and provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets), companies in the retail sector will spend nearly $1.3 billion on RFID in their supply chain operations in 2008, compared to about $91.5 million in 2003 which corresponds to annual growth rate of 70 percent. In a similar look; the Wireless Data Research Group projected that the global market for RFID increased from $1 billion in 2003 to $3 billion in 2007 (Asif & Mandviwalla, 2005). There are two major drivers of this growth. The first one is the adoption of RFID technology by major retailers and government agencies. The second one is the reduction in the price of RFID tags, readers, and information technology (IT) systems required to deploy RFID.

Given the significant potential of RFID technology, there has been a huge emergence of RFID specialty companies and the development of RFID practices within many market-leading companies. Due to huge emergence, it is desirable to make a sector analysis. In this study, we perform a sector analysis for RFID technologies for researchers and analysts. We investigate public RFID companies traded on the stock exchange markets, summarize their financial performance, describe their RF products, services, and applications, and perform fundamental and technical analysis.

2. RFID technology

RFID technology is a promising technology helping companies solve problems in supply chain management, manufacturing, security, identification and asset tracking. At the first glance, RFID appears to be a production and distribution technology; on the other hand, it is an IT system for data collection, storage, analysis, and distribution. Components of the RFID system are described as **RFID tags**, **RFID readers**, and **RFID data processing system**.

RFID tags are the most important component of an RFID system. A typical RFID tag contains the following three components; the integrated circuits (IC) chip, the antenna, and the enclosure. The IC chip is used for the unique data storage and logical operations associated with the RFID tag, whereas the antenna is used for communication between readers. Data is stored in the IC chips and transmitted through the antenna. The enclosure is the packaging around the electronic components. RFID tags can be active or passive according to the supply of electronic power. Active RFID tags use a battery to power IC chip and broadcast signals to the reader. Passive tags do not have batteries and are powered by the electromagnetic waves sent out by a reader to induce a current in the tag's antenna. Passive tags have unique identification number in them that cannot be changed and are transferred into a computer database in which the ID is associated with product characteristics; while in active tags, the information can be written, erased and rewritten. The advantage of active tags over passive ones is that the reader can be far away from the device and still get the signal.

RFID readers communicate with the RFID tags. They are RF devices designed to detect and read tags to obtain the information stored in RFID tags. Retrieval of information from the

RFID tags needs scanning by a reader. The reader powers the antenna to generate the RF field. The RFID reader can send RF signal to the RFID tag and receive the information from the RFID tag, and then send this information to the RFID data processing system.
The **RFID data processing system** stores related information such as product information, tracking logs, reader location, and so on with a particular tag. Since information retrieving and storing can be performed easily and speedily from RFID tags, "saving time" is the main advantage of RFID technology.
The implementation of RFID systems will cost companies millions of dollars. Specific costs for the systems include RFID tags, RFID readers, tag printers, middleware, IT infrastructure, consulting, research and development (R&D), changes to internal business systems, training, third party licensing, facilities changes, and labor. The stages of the proactive implementation of RFID technologies are summarized for IT and business managers by Angeles (Angeles, 2005) as follows; make the return on investment case for RFID; choose the right RFID technology; anticipate RFID technical problems; manage the IT infrastructure issues such as data management concerns and integration with back-end applications; and leverage pilot project learning experiences. Nowadays, RFID technology is a very hot and useful technology because low-cost RFID tags are capable of reading or writing information corresponding to an entity without physical contact, while it possesses a fast recognition speed, and has a relatively greater storing ability compared to barcodes. RFID works better and user friendly than barcodes. High reliability and longer life than barcodes are other advantages of RFID technology.

3. Public RFID companies and their business descriptions

Companies of RFID industry have lofty goal. By eliminating wasteful time and labor, they hope to save money, to improve the product quality or to provide better service. This industry is a fast growing one and there are many companies in this area. We have analyzed thirty three public RFID companies traded on the stock exchange markets. For a detailed reading, one can look at the study by Asif and Mandviwalla (Asif & Mandviwalla, 2005), Kasap et al., 2007, and (RFIDinvesting.com, 2007). Most of these companies, more specifically twenty four of them are from USA, and the rest of them are from UK, Canada, Germany, India, Israel, and Korea. It can be seen that most of these companies are traded on the USA based stock exchange markets for instance, NASDAQ have thirteen RFID companies, New York Stock Exchange (NYSE) have twelve RFID companies, OTC Bulletin Board (OTCBB) have two RFID companies. NASDAQ is the largest U.S. electronic stock market with approximately 3,200 companies; it lists more companies and, on average, trades more shares per day than any other U.S. market. NASDAQ is home to companies that are leaders across all areas of business, including technology, retail, communications, financial services, transportation, media and biotechnology. In addition to the US based stock exchange markets, both London Stock Exchange (LSE) and Toronto Stock Exchange (TSE) markets have two RFID companies. Korea Stock Exchange and India Stock Exchange markets have only one RFID company. Furthermore, some of these companies have RFID as their primary business and some have RFID as part of their business. Some of these companies design and manufacture RFID technologies and equipments, some offer consulting services for RFID adoption, and some are providers of other RFID solutions. The RFID industry may be classified into hardware, software, system integration, printing, and services sectors. Names, locations, general business descriptions, and RFID business descriptions (products, services, and applications) of these companies are provided in detail in Table 1.

Name SYMBOL MARKET	Location	Business Description	RFID Application
3M MMM NYSE	USA	Creates innovative products and services in diversified areas	Tracking and management of physical files and library materials
Advanced ID AIDO.OB OTCBB	Canada	Markets RFID components	Animal and biological sciences, bio-security and food safety
Alanco Tech ALAN NASDAQ	USA	Provider of IT solutions	Tracking technology
Atmel ATML NASDAQ	USA	Designs, manufactures, & sells RF semiconductors	Security and access control, manufacturing and logistics, and animal identification
Avery Dennison AVY NYSE	USA	Markets RFID components	Retail industry
Axcess Int AXSI.OB OTCBB	USA	Provider of security and asset management systems	Personnel and vehicle access control and automatic asset tracking and protection
Baxter International BAX NYSE	USA	Provider of QuickFind Asset Management systems	Determination of any tagged asset in healthcare industry
Bearingpoint BE NYSE	USA	Provider of technology and management consulting services	Helps organizations create a RFID program
Brady BRC NYSE	USA	Markets RFID components	General
BT Auto-ID Services BT-A.L LSE	UK	Provider of RFID services	Supply Chain Management
CCL Label CCL-A.TO TSX	USA	Provider of RFID labels	Packaging, promotional and pharmaceutical industries
Checkpoint CKP NYSE	USA	Manufactures and markets integrated RFID system solutions	Retail security, labeling and merchandising
Digital Angel DIGA NASDAQ	USA	Develops, manufactures, & markets RFID devices	Security for people, animals, food supply, private area, and commercial assets
I.D. Systems IDSY NASDAQ	USA	Develops, markets, and sales wireless solutions	Managing and securing enterprise assets

Table 1. Public RFID Companies, Business Descriptions, and RFID Applications

Name SYMBOL MARKET	Location	Business Description	RFID Application
IBM IBM NYSE	USA	Operates as an IT company	General
Infineon Tech IFX NYSE	Germany	Designs, develops, & sells semiconductors and systems	Telecommunication industry
Infosys TEch INFY NASDAQ	India	Provider of IT solutions	RFID adoption
Innovision Res & Tech INN.L LSE	UK	Designs, develops, & licenses RFID solutions	General
Intermec IN NYSE	USA	Designs, manufactures & markets RFID products and systems	General
International Paper IP NYSE	USA	Designs, manufactures & markets RFID products and systems	Paper, packaging, and forest products.
Manhattan Assoc MANH NASDAQ	USA	Provider of IT solutions	Supply chain management
NCR NCR NYSE	USA	Provider of IT solutions	Retail environment
Patni Computer Sys PATNI.NS NSE of India	India	Provider of IT services and solutions	Feasibility studies, business-case analysis, product/process/IT audits
RF Micro Devices RFMD NASDAQ	USA	Designs, manufactures & markets RF semiconductors	Mobile communications
Samsung 006400.KS KSE	Korea	Manufactures semiconductors and equipments	RFID-enabled manufacturing
ScanSource SCSC NASDAQ	USA	Markets RFID components	General
SIRIT SI.TO TSX	Canada	Designs, develops, manufactures & sells RFID technology	Supply Chain, Cashless Payment, Inventory Control, Asset Tracking

Table 1 (continued). Public RFID Companies, Business Descriptions, and RFID Applications

Name SYMBOL MARKET	Location	Business Description	RFID Application
Socket Communication SCKT NASDAQ	USA	Designs, manufactures and markets RFID components	General
SPAR Group SGRP NASDAQ	USA	Provider of RFID services	Technology and marketing research services.
Texas Instruments TXN NYSE	USA	Manufactures & sells high-tech components and systems	Commercial electronic and electrical equipment industry
Tower Semiconductor TSEM NASDAQ	Israel	Designs & manufactures RF semiconductors	Telecommunication, healthcare, consumer, and industrial
Verisign VRSN NASDAQ	USA	Provider of IT services and solutions	Internet and telecommunications networks
Zebra Tech ZBRA NASDAQ	USA	Designs, markets, & manufactures, and RFID components	General

Table 1 (continued). Public RFID Companies, Business Descriptions, and RFID Applications

4. Financial performance analysis

Nowadays, many companies, financial institutions and organizations use advanced operations research techniques to improve their financial decision making, to estimate and reduce financial risks to which they are exposed, and generally to advance their financial operation and decision making processes. Financial decision making needs some factors of stock market to be determined and analyzed initially. These factors are mainly market risk and sector risk related to the sector under consideration. Market risk can be defined as the risk that the value of an investment will decrease due to moves in market factors. After market risk, the most influential factor in the performance of a stock is the sector risk. An industry sector consists of companies in closely related businesses such as financials, healthcare, airlines, retailers, etc. Stocks within a sector tend to move together because companies within the same industry group are affected in similar ways by market and economic conditions. One of the financial decision making problems can be defined as to determine which sectors are hot and which ones are cooling down by tracking industry groups. Once a sector trend is identified, the group "rotates into favor" as one institution after another begins accumulating shares in the best companies in the group. As more money flows into the group, the best companies become fully valued and money moves into secondary stocks in the sector. Eventually the group becomes overpriced, or economic conditions for the group turn unfavorable, then money rotates into the next hot sector. Note

that, no matter what the overall market is doing, one can always find some industry groups moving up and others heading down. A popular investment strategy is to pick the strongest stock in a strong industry. For this, fundamental analysis and technical analysis are performed, after a sector is identified. While fundamental analysis studies the reasons or causes for price movements, technical analysis studies the effect of the price movement itself. Researchers and analysts (practitioners and academicians) of financial markets in general deal with stocks and analyze one or more companies.

4.1 Fundamental analysis

Fundamental analysis is basically investigation of real value of a stock by analyzing all financial/economic data/information related to company. In other words, the trading price of a stock does not totally reflect the real value of the stock and in the long-run, market value of the stock is assumed to converge to its real value. Thus, to make a sell/buy decision about a stock, to make selection of which stocks to sell/buy and to take a position in the market, it is necessary to know the real value of the stocks. In order to find the real value of a stock, different valuation methods can be employed and fundamental analysis is one of them. To evaluate the value of a stock, fundamental analysis simply uses information about the past, current and future (anticipated) status of the company and its operations; the features of the company; the market in which it operates and competitors; any financial/economic factor that affect the business and movements of the company; any quantitative/ qualitative issue that influence the value of the stock. In this respect, such an analysis is also helpful in assessing the current and expected performances of the companies in that industry, performance of the whole sector, and shaping the investment decisions (Thomsett, 2006). Specifically, fundamental analysis involves examination of business model of the company; strength of/weakness of/opportunity for/threat for the company; structure and decision making policy of the management; operational decisions and news declared by the company; financial statements (income statement, balance sheet, cash flow statement); financial indicators about the company (such as revenue, expense, profit, earnings per share, price to earnings ratio, projected earning growth, quick ratio, dividend payments, dividend payout ratio, book value, price to book ratio, price to sales ratio, return on equity, financing data, investment data); market share; customer structure; characteristics of the market (such as growth rate, competitors, government regulations, pricing structure); macroeconomic indicators (such as gross domestic/national product, interest rate, inflation rate, stock market indices, employment data, unemployment rate, capacity usage, business cycle, money demand/supply, credit demand/supply, monetary policy). Investigation of all these information and data shows that fundamental analysis is a long-term study.

4.2 Technical analysis

Technical analysis is the anticipation of future price movements of a stock, price trend, and trade volume by using past prices, trading volume data, supply and demand data of that stock and information about the stock market over a specific time period. There are three fundamental thoughts lying beneath the technical analysis. The first one is that stock price reflects all publicly available information related to that stock so, we can rely on the price movements to make sell/buy decisions. Secondly, it is believed that stock prices follow

trends and for this, it is important to anticipate trend behavior of the stocks. Finally, it is assumed that investors tend to show comparable reactions to similar market actions in time therefore, studying past behavior and past data reveals valuable information about the future performance of the stock prices. As opposed to fundamental analysis, technical analysis is a short-term study(Kirkpatrick & Dahlquist, 2006).

In technical analysis, it is important to identify the type and time horizon of trend, whether it is uptrend, downtrend, horizontal trend (sideway), long-term, medium term or short-term trend. Then support and resistance prices come which should be examined. Price of a stock rarely goes above a resistance price and below support price. The next aspect is the volume of trade for that stock. Higher trade volume shows that the stock is active. While performing a technical analysis, use of different types of charts with different time scales is customary and these charts are the most important analysis tools. For this reason, technical analysis is also called chart analysis. The most widely used charts are line chart, bar chart, candlestick chart, point and figure chart. Price movements can exhibit different chart patterns such as head and shoulders, cup and handle, double tops and bottoms, triangles, flag and pennant, wedge, gaps, triple tops and bottoms, rounding bottom. In order to calculate price trend of a stock, different measurement techniques can be used like simple moving average, linear weighted average, exponential moving average and regression. Various types of indicators are employed to infer the future behavior of stock and its volume, some of these indicators are accumulation/distribution line, average directional index, moving average convergence divergence, relative strength index, on-balance volume, stochastic oscillator.

5. Financial performance analysis of public RFID companies

To analyze financial performances of the companies listed in Table 1, first, we have collected their daily stock exchange market data that include open, low, high, close prices and trading volumes from January, 2 2005 to August, 29 2008. For each company, trading symbols, trading exchange markets, current one-share price by August 30, 2008, average trading volumes, and market capitalizations are provided in Table 2. Share price and market capitalizations of public RFID companies change with a wide range. Market capitalization is calculated by multiplying a company's shares outstanding by the current market price of one share. Market capitalization, frequently referred to as "market cap", can be defined as the total dollar market value of all of a company's outstanding shares. Public RFID companies can be classified by their market caps as large, mid, small, micro, and nano caps. In general, **"Large Cap"** refers to companies with a market capitalization value of more than $10 billion such as IBM, 3M, Baxter International, Texas Instruments, and International Paper. **"Mid Cap"** is a company with a market capitalization of between $2 billion and $10 billion such as Infineon Technologies, Verisign, Avery Dennison, NCR, and Zebra Technologies. **"Small Cap"** is a company with a market capitalization of between 300 million and $2 billion such as Brady, Atmel, Intermec, RF Micro Devices, Checkpoint, ScanSource, and Manhattan Associates. **"Micro Cap"** is a company with a market capitalization of between 50 million and 300 million such as Bearingpoint, I.D. Systems, Tower Semiconductor, and Digital Angel. **"Nano Cap"** is a company with a market capitalization of less than 50 million such as Alanco Technologies, Axcess International, Socket Communications, and SPAR Group. Note that classifications such as "Large Cap" or "Small Cap" are only approximations that change over time.

Company Name	Trading Symbol	Trading Market	Share Price	Average Volume	Market Capital
3M	MMM	NYSE	71.6	5,315,030	50.05B
Advanced ID	AIDO.OB	OTCBB	0.26	133,197	N/A
Alanco Technologies	ALAN	NASDAQ	1.2	16,801.50	38M
Atmel	ATML	NASDAQ	4.19	4,323,230	1.87B
Avery Dennison	AVY	NYSE	48.24	1,165,040	5.14B
Axcess International	AXSI.OB	OTCBB	0.88	12,048.40	26.58M
Baxter International	BAX	NYSE	67.76	4,180,760	41.89B
Bearingpoint	BE	NYSE	1.14	1,628,810	248.52M
Brady	BRC	NYSE	36.71	353,675	1.96B
BT Auto-ID Services	BT-A.L	LSE	172.4	44,866,900	N/A
CCL Label	CCL-A.TO	TSX	28.5	7.8125	N/A
Checkpoint	CKP	NYSE	21.29	292,614	822.26M
Digital Angel	DIGA	NASDAQ	0.51	284,978	63.77M
I.D. Systems	IDSY	NASDAQ	8.99	22,335.40	93.10M
IBM	IBM	NYSE	121.73	8,889,090	164.92B
Infineon Technologies	IFX	NYSE	8.51	3,025,890	6.38B
Infosys Technologies	INFY	NASDAQ	41.28	3,436,480	N/A
Innovision Res. & Tech	INN.L	LSE	11.88	39,952.90	N/A
Intermec	IN	NYSE	20.09	515,472	1.24B
International Paper	IP	NYSE	27.05	6,140,980	11.57B
Manhattan Associates	MANH	NASDAQ	24.51	319,277	600.99M
NCR	NCR	NYSE	26.46	1,758,140	4.34B
Patni Computer Systems	PATNI.NS	NSE of India	229.5	237,519	N/A
RF Micro Devices	RFMD	NASDAQ	3.88	8,057,830	1.02B
Samsung	006400.KS	KSE	83,300.00	479,605	N/A
ScanSource	SCSC	NASDAQ	30.09	190,022	792.84M
SIRIT	SI.TO	TSX	0.18	103,492	N/A
Socket Communications	SCKT	NASDAQ	0.67	21,324.60	21.64M
SPAR Group	SGRP	NASDAQ	1	3,033.85	19.13M
Texas Instruments	TXN	NYSE	24.51	18,612,600	32.13B
Tower Semiconductor	TSEM	NASDAQ	0.73	92,075.40	91.5M
Verisign	VRSN	NASDAQ	31.97	5,366,010	6.18B
Zebra Technologies	ZBRA	NASDAQ	31.22	532,357	2.03B

Table 2. Public RFID Companies, Symbol, Market, Price, Volume, and Market Capitals

Return on investment (ROI) is a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. To calculate ROI, the return of an investment is divided by the cost of the investment. ROI is a very popular metric because of its flexibility and simplicity. ROI for each public RFID company is calculated by dividing the open price to the close price for each year. Being up or down on the corresponding investment is calculated by dividing the high or low price to the open price for each year. Comparisons of financial performances of the public RFID companies are summarized in Tables 3, 4, 5, and 6 for the year 2005, 2006, 2007, and 2008, respectively.

Trading Symbol	Open Price	Price Range Low-High	Close Price	Up	Down	ROI
MMM	82.17	69.71 - 87.45	77.5	6.43%	-15.16%	-5.68%
AIDO.OB	0.33	0.12 - 0.42	0.14	27.27%	-63.64%	-57.58%
ALAN	2.5	1.13 - 3.43	1.4	37.20%	-54.80%	-44.00%
ATML	3.92	1.97 - 4.03	3.09	2.81%	-49.74%	-21.17%
AVY	59.72	49.6 - 63.58	55.27	6.46%	-16.95%	-7.45%
AXSI.OB	1.75	0.77 - 1.95	0.82	11.43%	-56.00%	-53.14%
BAX	34.6	33.08 - 41.07	37.65	18.70%	-4.39%	8.82%
BE	8	4.65 - 8.89	7.86	11.13%	-41.88%	-1.75%
BRC	30.3	26.3-39.9	36.18	31.68%	-13.20%	19.41%
BT-A.L	203	195.75 - 236.25	222.8	16.38%	-3.57%	9.73%
CCL-A.TO	19.25	18.33 - 31.5	28.5	63.64%	-4.78%	48.05%
CKP	18.05	15.14 - 25.43	24.65	40.89%	-16.12%	36.57%
DIGA	7.16	2.4 - 7.24	2.86	1.12%	-66.48%	-60.06%
IDSY	17.6	9.25 - 23.96	23.85	36.14%	-47.44%	35.51%
IBM	98.97	71.85 - 99.1	82.2	0.13%	-27.40%	-16.94%
IFX	11	8.3 - 11.02	9.1	0.18%	-24.55%	-17.27%
INFY	69.44	56.23 - 82.75	80.86	19.17%	-19.02%	16.45%
INN.L	98.5	75 - 162	77	64.47%	-23.86%	-21.83%
IN	25.2	16.69 - 37.04	33.8	46.98%	-33.77%	34.13%
IP	42.09	26.97 - 42.59	33.63	1.19%	-35.92%	-20.10%
MANH	23.94	17.35 - 24.36	20.48	1.75%	-27.53%	-14.45%
NCR	34.62	16.7 - 39.84	33.94	15.09%	-51.77%	-1.95%
PATNI.NS	386	307.05 - 506	493.3	31.09%	-20.45%	27.78%
RFMD	6.91	3.77 - 7.06	5.41	2.17%	-45.44%	-21.71%
006400.KS	114.00	93.1 - 125	116.50	9.65%	-18.33%	2.19%
SCSC	31.44	20.81 - 34.1	27.34	8.46%	-33.81%	-13.04%
SI.TO	1.57	0.27 - 1.59	0.37	1.27%	-82.80%	-76.43%
SCKT	2	0.88 - 2.04	1.13	2.00%	-56.00%	-43.50%
SGRP	1.04	0.81 - 2.89	0.9	177.88%	-22.12%	-13.46%
TXN	24.93	20.7 - 34.68	32.07	39.11%	-16.97%	28.64%
TSEM	2.38	0.92-2.38	1.45	0.00%	-61.34%	-39.08%
VRSN	33.31	19.01 - 33.67	21.9	1.08%	-42.93%	-34.25%
ZBRA	56.8	34.88 - 56.9	42.85	0.18%	-38.59%	-24.56%

Table 3. Financial performances of public RFID companies for 2005.

Return on investments also varies from year to year or from company to company. For the year 2005, the bottom five and top five ranked companies according to ROI were SIRIT (-76.43%), Digital Angel (-60.06%), Advanced ID (-57.58%), Axcess International (-53.14%), Alanco Technologies (-44.00%) and CCL Label (48.05%), Checkpoint (36.57%), I.D. Systems (35.51%), Intermec (34.13%), Texas Instruments (28.64%), respectively.

Trading Symbol	Open Price	Price Range Low-High	Close Price	Up	Down	ROI
MMM	77.76	67.05 - 88.35	77.93	13.62%	-13.77%	0.22%
AIDO.OB	0.14	0.12 - 1.4	0.26	900.00%	-14.29%	85.71%
ALAN	1.5	1.12 - 2.15	1.4	43.33%	-25.33%	-6.67%
ATML	3.08	3.06 - 6.43	6.05	108.77%	-0.65%	96.43%
AVY	56.22	54.95 - 69.31	67.93	23.28%	-2.26%	20.83%
AXSI.OB	0.85	0.82 - 1.47	1.17	72.94%	-3.53%	37.65%
BAX	38.9	35.12 - 48.54	46.4	24.78%	-9.72%	19.25%
BE	7.85	7.36 - 9.59	7.87	22.17%	-6.24%	0.25%
BRC	35.99	32.9 - 42.79	37.3	18.89%	-8.59%	3.58%
BT-A.L	222.8	201 - 319.75	301.5	43.55%	-9.76%	35.35%
CCL-A.TO	28.5	27.1 - 34.95	29.9	22.63%	-4.91%	4.91%
CKP	24.67	15.37 - 29.91	20.2	21.24%	-37.70%	-18.12%
DIGA	2.88	1.34 - 3.06	1.81	6.25%	-53.47%	-37.15%
IDSY	23.72	15.14 - 25.84	18.8	8.94%	-36.17%	-20.66%
IBM	82.45	72.73 - 97.88	97.2	18.71%	-11.79%	17.83%
IFX	9.3	9.12 – 14.14	14	52.04%	-1.94%	50.86%
INFY	81.24	37.85-85.15	54.6	4.81%	-53.41%	-32.84%
INN.L	77	30 - 80	41	3.90%	-61.04%	-46.75%
IN	34.99	20.5 - 38.81	24.3	10.92%	-41.41%	-30.64%
IP	34.04	30.69 - 37.98	34.1	11.57%	-9.84%	0.18%
MANH	20.49	17.68 - 31.2	30.1	52.27%	-13.71%	46.80%
NCR	34.2	31.64 - 44.74	42.76	30.82%	-7.49%	25.03%
PATNI.NS	500	250.05 - 510	417	2.00%	-49.99%	-16.52%
RFMD	5.45	5.25 - 9.58	6.79	75.78%	-3.67%	24.59%
006400.KS	116.00	56 - 116.5	64.30	0.43%	-51.72%	-44.57%
SCSC	27.62	26.33 - 32.39	30.4	17.27%	-4.67%	10.07%
SI.TO	0.36	0.14 - 0.48	0.19	33.33%	-61.11%	-47.22%
SCKT	1.14	0.72 - 1.75	1.12	53.51%	-36.84%	-1.75%
SGRP	1.08	0.87 - 2.2	1.22	103.70%	-19.44%	12.96%
TXN	32.16	26.77 - 36.4	28.8	13.18%	-16.76%	-10.45%
TSEM	1.56	1.22 - 2.18	1.71	39.74%	-21.79%	9.62%
VRSN	21.99	15.95 - 26.77	24.1	21.74%	-27.47%	9.37%
ZBRA	42.8	29.23 - 47.97	34.8	12.08%	-31.71%	-18.71%

Table 4. Financial performances of public RFID companies for 2006.

For the year 2006, the bottom five and top five ranked companies according to ROI were SIRIT (-47.22%), Innovision Res & Tech (-46.75%), Samsung (-44.57%), Digital Angel (-37.15%), Infosys Technologies (-32.84%) and NCR (105.42%), Atmel (96.43%), Advanced ID (85.71%), Infineon Technologies (50.86%), Manhattan Associates (46.80%), respectively.

Trading Symbol	Open Price	Price Range Low-High	Close Price	Up	Down	ROI
MMM	77.53	72.9 - 97	84.32	25.11%	-5.97%	8.76%
AIDO.OB	0.27	0.15 - 0.49	0.16	81.48%	-44.44%	-40.74%
ALAN	1.36	1.28-4.14	1.37	204.41%	-5.88%	0.74%
ATML	6.14	4.27 - 6.49	4.32	5.70%	-30.46%	-29.64%
AVY	68.47	49.69 - 71.35	53.14	4.21%	-27.43%	-22.39%
AXSI.OB	1.2	1.01 - 1.96	1.28	63.33%	-15.83%	6.67%
BAX	46.4	46.07 - 61.09	58.05	31.66%	-0.71%	25.11%
BE	7.9	2.45 - 8.56	2.83	8.35%	-68.99%	-64.18%
BRC	37.47	30.5 - 44.46	35.09	18.65%	-18.60%	-6.35%
BT-A.L	303.8	271.75 - 338	272.8	11.28%	-10.53%	-10.21%
CCL-A.TO	29.9	29.75 - 52.25	39.03	74.75%	-0.50%	30.54%
CKP	20.3	18.19 - 30.5	25.98	50.25%	-10.39%	27.98%
DIGA	1.89	0.41 - 2.33	0.42	23.28%	-78.31%	-77.78%
IDSY	18.9	8.9 - 18.9	12.46	0.00%	-52.91%	-34.07%
IBM	97.18	88.77-121.46	108.1	24.98%	-8.65%	11.24%
IFX	14.15	11.19 - 18.74	11.64	32.44%	-20.92%	-17.74%
INFY	55.53	38.6 - 61.25	45.36	10.30%	-30.49%	-18.31%
INN.L	41	23 - 66	25	60.98%	-43.90%	-39.02%
IN	24.37	20.12 - 30.16	20.31	23.76%	-17.44%	-16.66%
IP	34.23	31.05 - 41.57	32.28	21.44%	-9.29%	-5.70%
MANH	30.24	23.45 - 31.63	26.36	4.60%	-22.45%	-12.83%
NCR	42.9	42.34 - 57.5	51.8	34.03%	-1.31%	19.3%
PATNI.NS	423	297.25 - 599	331.9	41.61%	-29.73%	-21.54%
RFMD	6.92	5.4 - 8.6	5.71	24.28%	-21.97%	-17.49%
006400.KS	64.30	53.4 - 81.8	66.50	27.22%	-16.95%	3.42%
SCSC	30.4	25.22-39.5	32.35	29.93%	-17.04%	6.41%
SI.TO	0.18	0.16 - 0.53	0.27	194.44%	-11.11%	50.00%
SCKT	1.13	0.71 - 1.4	0.82	23.89%	-37.17%	-27.43%
SGRP	1.23	0.54-1.5	0.69	21.95%	-56.10%	-43.90%
TXN	29.12	28.24 - 39.63	33.4	36.09%	-3.02%	14.70%
TSEM	1.73	1.2 - 2.08	1.39	20.23%	-30.64%	-19.65%
VRSN	24.24	22.92 - 41.96	37.61	73.10%	-5.45%	55.16%
ZBRA	35	32.93 - 42.5	34.7	21.43%	-5.91%	-0.86%

Table 5. Financial performances of public RFID companies for 2007.

Consequently, for the year 2007, the bottom five and top five ranked companies according to ROI were Digital Angel (-77.78%), Bearingpoint (-64.18%), SPAR Group (-43.90%), Advanced ID (-40.74%), Innovision Res & Tech (-39.02%) and Verisign (55.16%), NCR (49.23%), SIRIT (42.11%), CCL Label (30.54%), Checkpoint (27.98%), respectively.

Trading Symbol	Open Price	Price Range Low-High	Close Price	Up	Down	ROI
MMM	84.24	67.26 - 84.76	71.6	0.62%	-20.16%	-15.00%
AIDO.OB	0.15	0.13 - 0.3	0.26	100.00%	-13.33%	73.33%
ALAN	1.4	0.85 - 1.7	1.2	21.43%	-39.29%	-14.29%
ATML	4.3	2.83-4.49	4.19	4.42%	-34.19%	-2.56%
AVY	53.21	40.05 - 53.74	48.24	1.00%	-24.73%	-9.34%
AXSI.OB	1.28	0.77 - 1.6	0.88	25.00%	-39.84%	-31.25%
BAX	57.9	54.82 - 71.53	67.76	23.54%	-5.32%	17.03%
BE	2.84	0.62 - 2.91	1.14	2.46%	-78.17%	-59.86%
BRC	34.95	28 - 40	36.71	14.45%	-19.89%	5.04%
BT-A.L	274	161.2 - 284.25	172.4	3.74%	-41.17%	-37.08%
CCL-A.TO	39.03	28.5 - 39.03	28.5	0.00%	-26.98%	-26.98%
CKP	25.95	17.97 - 28.38	21.29	9.36%	-30.75%	-17.96%
DIGA	0.44	0.44 - 0.96	0.51	118.18%	0.00%	15.91%
IDSY	12.41	5.5 - 12.94	8.99	4.27%	-55.68%	-27.56%
IBM	109	97.04-130.93	121.7	20.13%	-10.95%	11.69%
IFX	12.09	6.26 - 12.09	8.51	0.00%	-48.22%	-29.61%
INFY	45.36	32.65-50.12	41.28	10.49%	-28.02%	-8.99%
INN.L	25	10 - 28	11.88	12.00%	-60.00%	-52.48%
IN	20.3	15.09 - 24.96	20.09	22.96%	-25.67%	-1.03%
IP	32.42	21.66 - 33.77	27.05	4.16%	-33.19%	-16.56%
MANH	26.27	21 - 27.72	24.51	5.52%	-20.06%	-6.70%
NCR	51.04	45.33 - 54.17	52.54	6.13%	-11.19%	2.94%
PATNI.NS	332.9	170-338.95	229.5	1.82%	-48.93%	-31.06%
RFMD	5.72	2.52 - 5.77	3.88	0.87%	-55.94%	-32.17%
006400.KS	66.50	60.8 - 92.2	83.30	38.65%	-8.57%	25.26%
SCSC	32.26	22.61-38.21	30.09	18.44%	-29.91%	-6.73%
SI.TO	0.27	0.15 - 0.33	0.18	22.22%	-44.44%	-33.33%
SCKT	0.82	0.43 - 0.9	0.67	9.76%	-47.56%	-18.29%
SGRP	0.72	0.61 - 1.5	1	108.33%	-15.28%	38.89%
TXN	33	23.28 - 33.24	24.51	0.73%	-29.45%	-25.73%
TSEM	1.4	0.66 - 1.45	0.73	3.57%	-52.86%	-47.86%
VRSN	37.63	28.52 - 42.5	31.97	12.94%	-24.21%	-15.04%
ZBRA	34.8	27.5 - 38.47	31.22	10.55%	-20.98%	-10.29%

Table 6. Financial performances of public RFID companies for 2008.

Finally, for the year 2008, the bottom five and top five ranked companies according to ROI were Bearingpoint (-59.86%), Innovision Res. & Tech (-52.48%), Tower Semiconductor (-47.86%), BT Auto - ID Services (-37.08%), SIRIT (-33.33%) and Advanced ID (73.33%), SPAR Group (38.89%), Samsung (25.26%), Baxter International (17.03%), Digital Angel (15.91%), respectively. A comparison of ROI from January of 2005 to August of 2008 results the top five ranked companies as Baxter International (92.92%), NCR (51.78%), CCL Label (48.05%), IBM (23.00%), and Brady (21.16%). Note that, we have only one straight winner for four years, Baxter International and without a doubt it is the best performing public RFID Company. 5-year candle stick charts for the Baxter International and IBM are shown in Figures 1 and 2, respectively.

Fig. 1. 5-year candle stick chart for Baxter International.

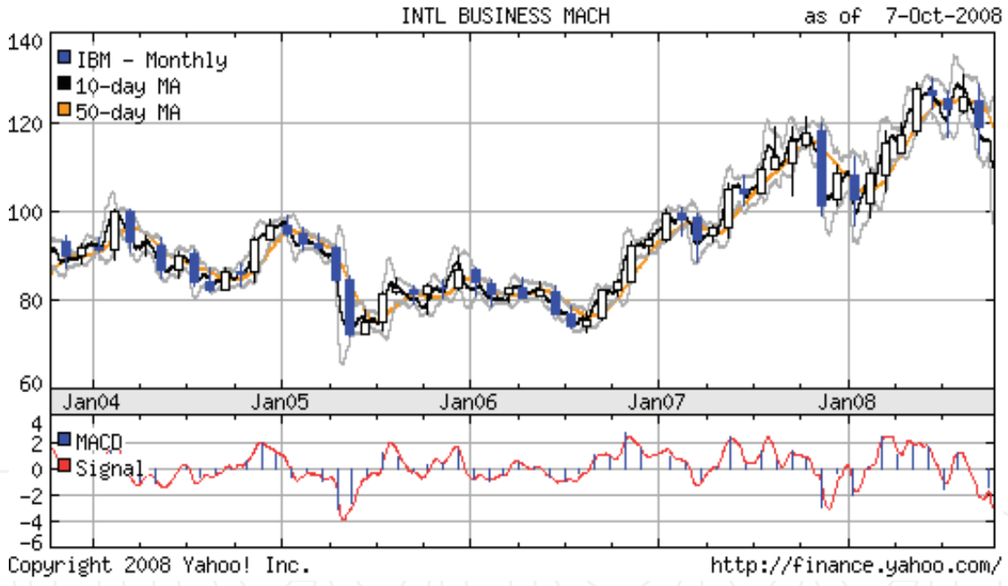

Fig. 2. 5-year candle stick chart for IBM.

A comparison of ROI from January of 2005 to August of 2008 indicates that as Digital Angel (-92.88%), SIRIT (-88.54%), Innovision Res. & Tech (-87.94%), Bearingpoint (-85.75%), and Tower Semiconductor (-69.33%) financially perform below the others. Note that, we have four straight losers for four years, which are Innovision Res. & Tech, Socket Communications, Zebra Technologies, and Alanco Technologies. Clearly, Digital Angel performed below the other public RFID companies. 5-year candle stick charts for the Digital Angel and SIRIT are shown in Figures 3 and 4, respectively.

Keep in mind that a portfolio with mature companies will have less volatility risk. The industry movement trend can be predicted by the knowledge of some stocks that sampled to reflect the industry credibly enough and weighted to give a reasonable industry index or

average. On the other hand, a portfolio of rapidly growing companies will have the potential for higher returns but also higher volatility levels. Our results for sector analysis revealed that RFID technologies are also similar. One of the most critical questions of the investment decision is to decide when to buy a stock. Technical analysis tools can help on such a decision.

Fig. 3. 5-year candle stick chart for Digital Angel.

Fig. 4. 5-year candle stick chart for SIRIT.

6. Conclusion

We investigated public RFID companies traded on the stock exchange markets, summarized their financial performances, described their RF products, services, and applications. We performed a sector analysis for RFID technologies for researchers and analysts. When

picking individual stocks, it is critical to know what type of industry the underlying company is participating in. The situation for which the company falls in the life cycle of its industry, if it is a smaller company about to experience rapid growth, or if it is a larger company that has already matured are the critical questions to maximize ROI or minimize risks. The most popular investment strategy is to pick the most promising or the strongest stock in a strong or promising industry. The RFID industry is emerging from its transition stage as businesses are ramping up their use of RFID technology. It is expected that this profitable sector will attract more investors looking for opportunities on the horizon.

7. References

Angeles, R. (2005). RFID Technologies: Supply-Chain Applications And Implementation Issues, *Information Systems Management*, Vol. 22, No. 1, pp. 51-65

Asif, Z. & Mandviwalla, M. (2005). Integrating The Supply Chain With RFID: A Technical and Business Analysis, *Communications of the Association for Information Systems*, Vol. 15, pp. 393-427

Ferguson, R. B. (2006). Logan Airport to Demonstrate Baggage, Passenger RFID Tracking, retrieved from *http://www.eweek.com/c/a/Mobile-and-Wireless/Logan-Airport-to-Demonstrate-Baggage-Passenger-RFID-Tracking/*

Finkenzeller, F. (2003). *RFID Handbook: Radio-Frequency Identification Fundamentals and Applications*, John Wiley and Sons, ISBN: 978-0-470-84402-1, New York

Kasap, S.; Testik, M. C. & Kasap, N. (2007). Business Descriptions and Financial Performance Analysis of Public RFID Companies, *Proceedings of the RFID EURASIA 2007*, pp. 238-243, Istanbul, September 2007

Kirkpatrick, C. D. & Dahlquist, J. R. (2006). Technical Analysis: The Complete Resource for Financial Market Technicians, FT Press, ISBN: 978-0131531130, New jersey, USA

Knels, R. (2006). Radio Frequency Identification (RFID): An Experience in Transfusion Medicine, *ISBT Science Series*, Vol. 1, No. 1, (September 2006), pp. 238-241

Liu, F. & Miao, Z. (2006). The Application of RFID Technology in Production Control in the Discrete Manufacturing Industry, *Proceedings of the IEEE International Conference on Video and Signal Based Surveillance (AVSS'06)*, pp. 68, ISBN: 0-7695-2688-8, Sydney Australia, November 2006, IEEE Computer Society, Washington D.C.

Ramachandran, S. (2006). RFID Technology and the Payment Process Systems, In: *Cash to Plastic: Issues and Perspectives*, DaSilva, A. F. C. & Ashiya, M. (Ed.), pp. 37-41, ICFAI University Press, ISBN: 81-314-0419-6, India

Ranger, S. (2006). RFID Blood-Tracking Trial Planned, retrieved from *http://www.silicon.com/publicsector/0,3800010409,39161664,00.htm*

Rfidinvesting.com (2007). Radio Frequency Identification (RFID) Technology Stocks Directory, retrieved from *http://www.rfidinvesting.com/RFID/Stock_List.asp.*

Shahid, S. (2005). Use of RFID Technology in Libraries: A New Approach to Circulation, Tracking, Inventorying, and Security of Library Materials, *Library Philosophy and Practice*, Vol. 8, No. 1, (Fall 2005)

Simpson, G. (2006). New RFID Tech Would Track Airport Passengers, retrieved from *http://news.zdnet.com/New-RFID-tech-would-track-airport-passengers/2100-7355_3-6125799.html*

Smith, R. (2004). RFID: A Brief Technology Analysis, *White Paper*, CTOnet.org

Thomsett, M.C. (2006). *Getting Started in Fundamental Analysis*, John Wiley and Sons, ISBN: 978-0471754466, New Jersey, USA

Development and Implementation of RFID Technology

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The book generously covers a wide range of aspects and issues related to RFID systems, namely the design of RFID antennas, RFID readers and the variety of tags (e.g. UHF tags for sensing applications, surface acoustic wave RFID tags, smart RFID tags), complex RFID systems, security and privacy issues in RFID applications, as well as the selection of encryption algorithms. The book offers new insights, solutions and ideas for the design of efficient RFID architectures and applications. While not pretending to be comprehensive, its wide coverage may be appropriate not only for RFID novices but also for experienced technical professionals and RFID aficionados.

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