

**QuickUp Analysis of Wireless Sensor Network Startup
Companies**

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12/13/2006**

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1. Acknowledgements

This project would not have been possible without the help of both scholarly resources and dedicated people. I acknowledge use of the efforts of the Nesheim Group, publisher of QuickUp software, and the wealth of publicly available information on sensor networks provided by companies in the industry. I would also like to thank the Ohio State University project teams GreenFang and Accel to 3D for making their project reports accessible, and for the opportunity to observe their oral presentations. The main author of the WiFiveO business plan Brian Dupaix, has provided a great deal of information for the purposes of this analysis. Finally, I would like to thank the tireless help of Dr. Steven Bibyk for giving me guidance in both this project and my career.

2. Scope

The past decade has seen a relative explosion in the field of wireless sensing applications. The market for sensing equipment and sensing applications has increased rapidly and has been subject to constant changes. Many startup companies have emerged in this market seeking to create new profitable ideas and to influence the standardization of new technology. This paper seeks to provide a basic explanation of the wireless sensor market as it currently exists in the United States. First is given a very brief overview of some companies (many of them startups) currently in the wireless sensing market. Methods of acquiring accurate market data are also explored. The startup company modeling software QuickUp¹ is then introduced. Its ability to model a wireless sensor network company realistically is demonstrated by comparing its results with those of the WiFiveO business plan. Further, the paper will investigate the viability of two wireless sensor applications in the context of creating startups. The detailed analysis involves two Ohio State University project teams, GreenFang and Accel to 3-D. Full QuickUp models are provided, with conclusions focusing on attaining profitability as a startup company with this technology.

3. Introduction to Sensor Networks

There are many instances where certain environmental data must be gathered over a large area. Temperature, vibrations, sound, and the presence of intruders are just a few of the potential requirements in a given space. A *Wireless Sensor Network* is a computer network consisting of generally small nodes, commonly referred to as motes. The amount of hardware contained in each individual mote varies, but most have at least one type of environmental sensor, a microcontroller that runs the system software, radio hardware, and an energy source. Each mote

communicates with other motes wirelessly; in general, all communications reach a base station with considerably more processing power to collect all of the data.²

The motivation behind using wireless sensor networks lies in their versatility, especially in environments where conventional sensing is not feasible. Remote areas or applications that require large numbers of sensors are of particular interest.

3.1. Developing Standards

In an emerging market such as that of wireless sensors, there is often a struggle to develop excellent standards at the same rate that technology increases. Still, progress has been made in this area and it is important to note the standards that any new company may need to adopt.

3.1.1. IEEE 802.15 WPAN Task Group 4 (TG4)

Currently wireless sensor networks as defined in this paper fall under this Wireless Personal Area Network (WPAN) category. The standard was created to support new applications demanding low bandwidth with power consumption at a premium. The standard also addresses robustness with fully handshaked communication, enhancing reliability. The hardware requirements ensure very low radio hardware complexity.³

3.1.2. ZigBee

ZigBee standardizes a set of high-level communication protocols for use with IEEE 802.15. This further addresses the needs for low power consumption and unattended operation. Companies may use this standard by becoming members of the ZigBee Alliance. This is similar in function to the WiFi Alliance for personal computing. Currently membership fees are based on three tiers: Adopter, Participant, and Promoter. The costs to the adopting company are currently \$3500, \$9500, and \$40000 USD respectively. Fees per product developed may also apply.⁴

ZigBee is currently the standard of choice among sensor companies, with most offering fully compliant devices. Still, some companies utilize proprietary nonstandard protocols. The costs of membership into the alliance will likely be a factor in any new startup venture.

3.1.3. 6lowPAN

The acronym 6lowPAN stands for IPv6 Over Low Power Personal Area Networks. It is actually a “working group” conducting research into allowing IPv6 packets to be sent over 802.15.4-based networks. The group seeks to coexist with other technologies and help bridge the current gap between wireless networks and the traditional internet, where IP packets are the norm. Such efforts may ultimately lead to formal standards adoptable by companies.⁵

3.2. Challenges in Sensing Applications

Any company seeking to apply wireless sensing as a solution will face certain challenges. Energy is the most valuable resource in almost any sensor mote. Sensor motes are typically powered by standard batteries and must remain in their installation for months or years. Thus, the standards already discussed focus on robustness and low power consumption. The limited

range of motes arising from the low power requirement creates the need for some type of “hopping” algorithm allowing communication over distances.

Another difficulty of particular relevance here is that of processing power. Extreme low power microcontrollers using reduced operating systems and communicating through low bandwidth protocols will have very limited computing capability. This paper explores the viability of a company pursuing an image processing task, something that is known to be high on CPU needs. The main challenge will involve integrating low computing power sensors to process this data.

3.3. Current Market Expansion

The wireless sensor market was in its infancy only a few years ago. In early 2005, there were approximately 200,000 mote-based sensors in use. Market research firm Harbor Research estimates a potential 100 million units in use by 2008.⁶ The massive growth potential of sensor networks has led to significant research into new applications. This paper will investigate two Ohio State University projects utilizing sensor motes to obtain marketability.

4. Existing Companies in the Wireless Sensor Market

4.1. MoteIV Corporation

MoteIV Corporation was founded by three University of California, Berkeley students whose PhD research focused on robustness and application building for wireless sensor networks. They base their technology on the open source TinyOS software platform. Currently they have three major products:

- TMote Invent – A fully packaged sensor mote designed for industrial use, geared mainly toward building security.
- TMote Sky – MoteIV’s standard “bare circuit board” mote package.
- TMote Connect – A module based on Linksys technology to allow wireless motes to connect to Ethernet networks.

The MoteIV Corporation is currently noted for being the first wireless sensor company to use its sensors for first responders. The system is intended to allow firefighters to coordinate their efforts with the help of a “team leader” monitoring progress from the ground.⁷

4.2. Cirronet Corporation

The Cirronet Corporation is an Atlanta based company that has been in the wireless sensor industry since 1987. Their most recent major breakthrough was in the wireless broadband internet access market. Their network supplies “broadband delivery in remote settings and otherwise challenging terrain.” They adhere to the ZigBee standard and primarily offer the following:

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- ZigBee Gateways – Allow the connection of ZigBee networks to ModBus and Ethernet networks.
- ZigBee OEM Modules – A simple “you provide the sensor” solution. These modules allow for the connection of a wide variety of sensors to a network.⁸

4.3. Crossbow Technology Inc.

This California based company was founded in 1995. Their open-source TinyOS-based platform, first shipped in 2002, was “the industry’s only open architecture wireless sensor networking platform.” The company is also a leader in inertial sensing systems for aviation applications. This company actually manufactures this specialized sensing equipment for use in wired and wireless applications. Their sensor offers include:

- Gyros
- Accelerometers
- Tilt
- Magnetic

Crossbow considers itself an “end-to-end” supplier. They offer products spanning the full range of wireless sensor based equipment, from software development kits (MoteWorks Architecture) to hardware mote kits for OEM’s.⁹

4.4. Dust Networks

Dust Networks was founded in 2002 by Kris Pister. The company produces wireless sensor technology based around their SmartMesh-XT platform. Their wireless boards are known for their extremely low power consumption, especially with all motes functioning as routing nodes. As with most hardware manufacturers, motes are available in 900MHz and 2.4GHz versions.

4.5. MicroStrain Inc.

This privately held sensor company is based in Williston, Vermont. Since 1987, they have been manufacturing extremely tiny displacement sensors for use in various applications. They have entered the wireless sensor market with the rollout of the following wireless nodes:

- Voltage Node
- Strain Node
- Accelerometer Node
- Thermocouple Node

In addition, MicroStrain has a fully capable software development kit for its range of sensors. The data acquisition system is known as Agile-Link and is designed to allow its sensors to communicate individually with a standard PC. Their sensors follow the 802.15.4 standard but the sensors and base station system are not ZigBee compliant. Their sensors are designed for applications where the sensor can communicate directly with the base station at high bandwidth.

This gives their sensors excellent range and data capability, at the expense of higher power consumption.¹⁰

5. Market Research Firms and the Wireless Sensor Industry

5.1. Electronics.ca Publications

This Canada based firm provides a wealth of market research data specifically tailored to the electronics industry. From the official site:

Electronics.ca Publications is a world-class research network and publishing company whose focus is technology and market research for the electronics industry. Our network spans dozens of areas of electronics expertise, and taps the knowledge of researchers and analysts internationally. We deliver critical information on the semiconductor, electronics manufacturing, wireless technology and converging markets, to name a few, in the form of off-the-shelf reports, training materials, and industry standards.¹¹

This firm currently offers the following reports of interest:

<u>Comprehensive Analysis of Wireless Sensor Systems Market</u>	\$1495
<u>Wireless Sensors – A North American Strategic Business Report</u>	\$3950

5.2. ABI Research

ABI Research is a technology market research firm headquartered in Oyster Bay, NY. Their research specializes in the area of emerging technology markets, making their data of particular value for wireless sensor applications. From the official site:

ABI Research was founded in 1990 to assist manufacturers of wireless semiconductor components in understanding and entering new markets. As tech-driven emerging markets proliferated during the 90's, ABI Research expanded its analytical coverage to a broader base of manufacturers and service companies participating in the technology market revolution.¹²

This company provides a report on the climate of the current wireless sensor market:

<u>Wireless Sensor Networks: Market Analysis of 802.15.4 IC's and ZigBee, Z-Wave, INSTEON and other mesh networking protocols</u>	\$4200
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5.3. MarketResearch.com

Marketresearch.com claims to be the world's largest collection of market research. They collect and maintain an extensive database of research reports from many global publishers.

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They have many reports of interest in this area, commenting on both the state of wireless sensor markets and individual company profiles. See the following reports for more information:

<u>Wireless Sensors</u>	\$3950
<u>World Wireless Sensors and Transmitters Markets</u>	\$6000
<u>Wireless Sensor Systems Market</u>	\$1495

6. WiFiveO Business Plan Analysis

6.1. Purpose

This section compares a business plan for the wireless sensor network startup WiFiveO to a QuickUp model based on the same financial figures. Using QuickUp to create a startup company model using the same data should demonstrate the ability of QuickUp to create realistic startup models. The financial sheets and startup capital needed from QuickUp are compared to those predicted by the authors of WiFiveO's plan. This report assumes that the reader has read and is familiar with the WiFiveO business plan.¹³

6.2. Assumptions

The WiFiveO model requires assumptions to be made regarding sales figures, price per unit, all costs, etc. QuickUp cannot fit all of this data perfectly in a "plug and chug" fashion. Therefore, some assumptions and clarification is given regarding the data input into the model. Below each QuickUp model section are various notes regarding treatment of the data. See Section 9 for all WiFiveO financial source data.

6.3. QuickUp Model

6.3.1. Sales Model

	Year	1	2	3	4	5
SALES MODEL						
\$ in 000 unless otherwise indicated						
SALES: TOTAL						
Average Sales Price \$ per Unit		\$75.00	\$70.83	\$68.75	\$66.57	\$69.08
Sales Units in 000		1.000	6.000	16.000	25.500	34.625
Sales		\$75	\$425	\$1,100	\$1,698	\$2,392
COST OF GOOD SOLD						
Production Cost per Unit Sold \$/Unit		\$35.00	\$31.67	\$28.13	\$18.72	\$19.20
Sales Units in 000		1.000	6.000	16.000	25.500	34.625
Production Cost of Units Sold		\$35	\$190	\$450	\$477	\$665
Manufacturing / Operations - Headcount		1	1	2	3	5
Manufacturing / Operations - \$/HC		\$0	\$0	\$0	\$0	\$0
Manufacturing / Operations - Dept Expenses		\$0	\$0	\$0	\$0	\$0
Other Expenses - Mfg/Ops		\$0	\$0	\$0	\$0	\$0
Cost of Goods/Services Sold		\$35	\$190	\$450	\$477	\$665
Sales		\$75	\$425	\$1,100	\$1,698	\$2,392
Cost of Goods/Services Sold		\$35	\$190	\$450	\$477	\$665
Gross Margin		\$40	\$235	\$650	\$1,220	\$1,727
Sales		100%	100%	100%	100%	100%
Cost of Goods/Services Sold		47%	45%	41%	28%	28%
Gross Margin		53%	55%	59%	72%	72%

Figure 1: Sales Model

Notes

- Sales figures for each year are taken directly from the business plan
- WiFiveO's multiple products take some extra calculating. QuickUp only allows one type of product in the basic model, so a weighted average sale price and cost per unit is calculated. The result is the same.

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6.3.2. Operating Expenses

	Year	1	2	3	4	5
Headcount	<i>Headcount: End of Year</i>					
R&D/Engineering		1	1	2	4	5
Sales & Marketing & Customer Support		0	1	1	3	5
Finance General & Administrative		9	9	9	9	9
TOTAL HEADCOUNT		11	12	14	19	24
<i>\$Sales / Headcount</i>		\$7	\$35	\$81	\$89	\$100
		\$ in 000				
Operating Expenses include the entire expenses per department divided by number of people.						
NOTE: Operating Expenses includes everything: wages, health insurance, travel, depreciation, share of rent, supplies, and outside services and more.						
Operating Expenses per Headcount per Year						
R&D/Engineering		\$61	\$64	\$64	\$64	\$64
Sales & Marketing & Customer Support		\$61	\$64	\$64	\$64	\$64
Sales Commission % Sales		0%	0%	0%	0%	0%
Finance General & Administrative		\$7	\$13	\$33	\$33	\$33
Operating Expenses per Department per year						
R&D/Engineering		\$62	\$47	\$68	\$68	\$79
Sales (with commissions) & Marketing & Cust. Support		\$184	\$316	\$634	\$965	\$1,124
Finance General & Administrative		\$18	\$35	\$43	\$44	\$59
Operating Expenses		\$264	\$398	\$745	\$1,077	\$1,262

Figure 2: Operating Expenses

Notes

- In headcounts, the founders are classified as “Finance General and Administrative” in QuickUp, and other employees specified by WiFiveO are distributed roughly evenly among other categories of employees
- R&D/Engineering Expenses are calculated from WiFiveO as R&D + equipment + Rent + utilities +supplies + IT expenses
- Sales/Marketing/Customer Support Costs are calculated from Travel and Advertising + all wage expenses for all departments
- Finance General and Administrative costs are calculated from patent/legal expense + Bad debt + depreciation
- QuickUp prefers a per person analysis of wage costs. WiFiveO gives the wages of non-managers, but does not say exactly how these people are divided into departments. All costs are simply added together to obtain the total operating expenses, although the per-person data is as accurate as possible. The result is clearer this way.

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6.3.3. Income Statement

	Year	1	2	3	4	5
Income Statement		\$ in 000				
Sales		\$75	\$425	\$1,100	\$1,698	\$2,392
Cost of Goods Sold		\$35	\$190	\$450	\$477	\$665
Gross Margin		\$40	\$235	\$650	\$1,220	\$1,727
<i>Percent of Sales</i>		53%	55%	59%	72%	72%
R&D/Engineering		\$62	\$47	\$68	\$68	\$79
Sales & Marketing & Customer Support		\$184	\$316	\$634	\$965	\$1,124
Finance General & Administrative		\$18	\$35	\$43	\$44	\$59
Operating Expenses		\$264	\$398	\$745	\$1,077	\$1,262
Operating Profit		(\$224)	(\$163)	(\$95)	\$143	\$465
<i>Percent of Sales</i>		-299%	-38%	-9%	8%	19%
Total Interest Expense		\$0	\$0	\$0	\$0	\$0
Income Before Taxes		(\$224)	(\$163)	(\$95)	\$143	\$465
Provision for Income Taxes		0	0	0	0	44
Net Income		(\$224)	(\$163)	(\$95)	\$143	\$421
<i>Percent of Sales</i>		-299%	-38%	-9%	8%	18%

Figure 3: Income Statement

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6.3.4. Balance Sheet

	Year	1	2	3	4	5
Balance Sheet	\$ in 000					
Assets						
Checking Account		\$324	\$205	\$338	\$435	\$856
Balancer: Surplus Cash		\$46	\$42	\$68	\$93	\$61
Receivables		\$6	\$35	\$90	\$140	\$197
Inventory		\$3	\$16	\$37	\$39	\$55
Current Assets		\$379	\$298	\$533	\$706	\$1,168
Equipment		\$33	\$36	\$39	\$42	\$45
Cumulative Depreciation		\$11	\$23	\$36	\$39	\$42
Net Equipment		\$22	\$13	\$3	\$3	\$3
Total Assets		\$401	\$311	\$536	\$709	\$1,171
Liabilities and Equity						
Bank Debt		\$0	\$0	\$0	\$0	\$0
Leases - Current Portion		\$0	\$0	\$0	\$0	\$0
Accounts Payable		\$25	\$48	\$98	\$128	\$158
Taxes Payable		\$0	\$0	\$0	\$0	\$11
Current Liabilities		\$25	\$48	\$98	\$128	\$169
Leases - Long Term Portion		\$0	\$0	\$0	\$0	\$0
Total Liabilities		\$25	\$48	\$98	\$128	\$169
Cumulative Stock Sold - Venture Capital \$000		\$600	\$650	\$920	\$920	\$920
Beginning Retained Earnings		\$0	(\$224)	(\$387)	(\$482)	(\$339)
Net Income this period		(\$224)	(\$163)	(\$95)	\$143	\$421
Cumulative Retained Earnings		(\$224)	(\$387)	(\$482)	(\$339)	\$82
Total Shareholders' Equity		\$376	\$263	\$438	\$581	\$1,002
Total Liabilities and Equity		\$401	\$311	\$536	\$709	\$1,171
Total Liabilities and Equity		\$401	\$311	\$536	\$709	\$1,171
Total Assets less Surplus Cash		\$355	\$269	\$468	\$616	\$1,111
Difference		\$46	\$42	\$68	\$93	\$61

Difference goes to Surplus Cash.

Figure 4: Balance Sheet

Notes

- All of the values for “Checking Account” are taken from the WiFiveO balance sheet and are presumed to be arbitrary. (QuickUp lets you set this value)
- All WiFiveO equipment is considered “special” in the QuickUp model

6.3.5. Company Valuation

WiFiveO Technologies

\$ in 000 unless otherwise indicated

Year	1	2	3	4	5
	\$0.6	\$1.3	\$3.7	\$7.5	\$10.0

Company Valuation

Chosen Company Valuation is: "Post-Money" = Total Company Value in \$Millions	\$1.0	\$2.8	\$6.7	\$14.0	IPO \$19.0
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Alternative Valuations:					
Sales	\$75	\$425	\$1,100	\$1,698	\$2,392
Multiple of Revenue	4.0	4.0	4.0	4.0	4.0
Company Valuation \$Millions	\$0.300	\$2	\$4	\$7	\$10
Net Income	(\$224)	(\$163)	(\$95)	\$143	\$421
Multiple of Net Income	45	45	45	45	45
Company Valuation \$Millions	(\$10)	(\$7)	(\$4)	\$6	\$19

Figure 5: Company Valuation

6.3.6. Investor ROI

Investors' Return on Investment

Year	1	2	3	4	5
\$ in 000 unless otherwise indicated					
Sales	\$75	\$425	\$1,100	\$1,698	\$2,392
New Stock Sold - Venture Capital \$000	\$600	\$50	\$270	\$0	\$0
Cumulative Stock Sold - Venture Capital \$000	\$600	\$650	\$920	\$920	\$920
"Pre-Money" = Total Company Value in Millions	\$400	\$2,750	\$6,430	\$14,000	\$19,000
New Stock Sold - Venture Capital \$000	\$600	\$50	\$270	\$0	\$0
"Post-Money" = Total Company Value in Millions	\$1,000	\$2,800	\$6,700	\$14,000	\$19,000
TOTAL COMPANY Shares - Fully Diluted (000)	750	914	952	952	952
Pre-Money Co Value / Share Fully Dilluted	\$1.33	\$3.06	\$7.03	\$14.70	\$19.95
Post-Money Co Value / Share Fully Dilluted	\$1.33	\$3.06	\$7.03	\$14.70	\$19.95

Investors' Return on Investment

Investors' Multiple= (Year 5 \$/share)/(This Years' \$/share)

1\$ invested this year will grow X times to = \$/Share in Year 5

Investors' Multiple (Times \$1 Invested)	15.0	6.5	2.8	1.4	1.0
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Investors' ROI:

\$1 grows to Year 5 \$/Share at this interest rate per year:

Investors' ROI (Percent per Year) % p.a.	97%	87%	68%	36%	
Standard ROI (Percent per Year) % p.a.	100%	90%	70%	35%	0%

Figure 6: Investor ROI

6.3.7. Company Ownership

Company Ownership

	Year	1	2	3	4	5
Number of Shares in thousands 000			Number of shares in 000			
TOTAL Investors		450	466	505	505	505
TOTAL Non-Investors		300	448	448	448	448
TOTAL COMPANY Shares - Fully Diluted (000)		750	914	952	952	952
Investors						
Preferred Series A		450	450	450	450	450
Preferred Series B			16	16	16	16
Preferred Series C				38	38	38
Preferred Series D					0	0
TOTAL Investors		450	466	505	505	505
Non-Investors						
Founders		300	300	300	300	300
Vice Presidents and other Executives		0	90	90	90	90
Directors		0	36	36	36	36
Managers		0	14	14	14	14
Employees		0	7	7	7	7
Total Management & Employees		300	448	448	448	448
Contractors		0	0	0	0	0
Support Services		0	0	0	0	0
Other Non-Investors		0	0	0	0	0
Total Non-Mgt & Employees		0	0	0	0	0
TOTAL Non-Investors		300	448	448	448	448
Portion Owned						
TOTAL Investors		60.0%	51.0%	53.0%	53.0%	53.0%
TOTAL Non-Investors		40.0%	49.0%	47.0%	47.0%	47.0%
TOTAL COMPANY Shares - Fully Diluted (000)		100.0%	100.0%	100.0%	100.0%	100.0%
Investors						
Preferred Series A		60.0%	49.2%	47.2%	47.2%	47.2%
Preferred Series B		0.0%	1.8%	1.7%	1.7%	1.7%
Preferred Series C		0.0%	0.0%	4.0%	4.0%	4.0%
Preferred Series D		0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL Investors		60.0%	51.0%	53.0%	53.0%	53.0%
Non-Investors						
Founders		40.0%	32.8%	31.5%	31.5%	31.5%
Vice Presidents and other Executives		0.0%	9.9%	9.5%	9.5%	9.5%
Directors		0.0%	3.9%	3.8%	3.8%	3.8%
Managers		0.0%	1.6%	1.5%	1.5%	1.5%
Employees		0.0%	0.8%	0.8%	0.8%	0.8%
Total Management & Employees		40.0%	49.0%	47.0%	47.0%	47.0%
Contractors		0.0%	0.0%	0.0%	0.0%	0.0%
Support Services		0.0%	0.0%	0.0%	0.0%	0.0%
Other Non-Investors		0.0%	0.0%	0.0%	0.0%	0.0%
Total Non-Mgt & Employees		0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL Non-Investors		40.0%	49.0%	47.0%	47.0%	47.0%

Figure 7: Company Ownership

QuickUp Analysis of Wireless Sensor Network Startup Companies

6.3.8. Wealth

Wealth

\$ in 000 unless otherwise indicated

Year	1	2	3	4	5
"Post-Money" = Total Company Value in \$Millions	\$1	\$3	\$7	\$14	\$19
TOTAL COMPANY Shares - Fully Diluted (000)	750	914	952	952	952
Co Value / Share Fully Dilluted	\$1.33	\$3.06	\$7.03	\$14.70	\$19.95
TOTAL Investors	\$600	\$1,428	\$3,550	\$7,419	\$10,068
TOTAL Non-Investors	\$600	\$1,428	\$3,550	\$7,419	\$10,068
TOTAL COMPANY Shares - Fully Diluted (000)	1200	2857	7101	14837	20136

Investors	\$Millions				
Preferred Series A	\$0.60	\$1.38	\$3.17	\$6.61	\$8.98
Preferred Series B	\$0.00	\$0.05	\$0.11	\$0.24	\$0.33
Preferred Series C	\$0.00	\$0.00	\$0.27	\$0.56	\$0.77
Preferred Series D	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL Investors	\$0.60	\$1.43	\$3.55	\$7.42	\$10.07

Non-Investors	\$Millions				
Founders	\$0.40	\$0.92	\$2.11	\$4.41	\$5.98
Vice Presidents and other Executives	\$0.00	\$0.28	\$0.63	\$1.32	\$1.80
Directors	\$0.00	\$0.11	\$0.25	\$0.53	\$0.72
Managers	\$0.00	\$0.04	\$0.10	\$0.21	\$0.29
Employees	\$0.00	\$0.02	\$0.05	\$0.11	\$0.14
Total Management & Employees	\$0.40	\$1.37	\$3.15	\$6.58	\$8.93
Contractors	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Support Services	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Other Non-Investors	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Non-Mgt & Employees	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL Non-Investors	\$0.40	\$1.37	\$3.15	\$6.58	\$8.93

Figure 8: Wealth

6.3.9. Graphs and Charts

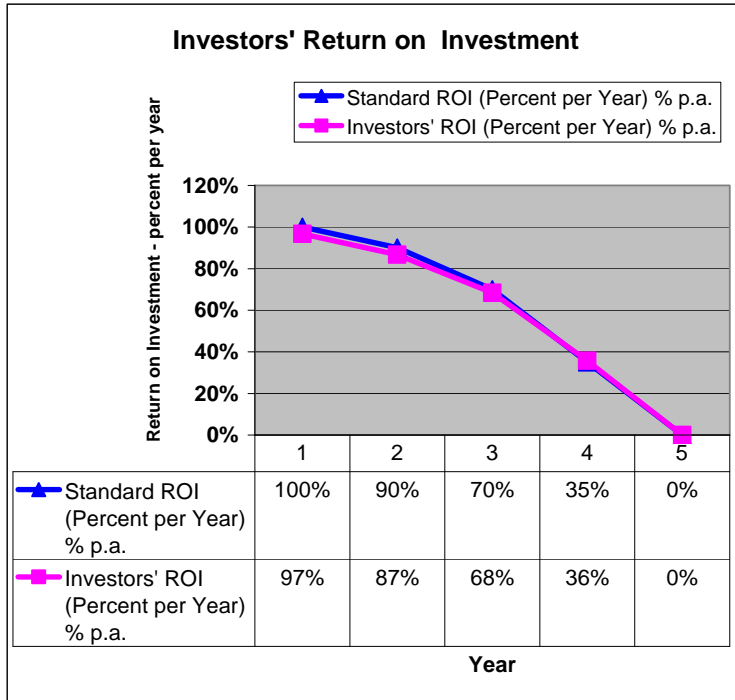


Figure 9: Investor ROI Curve

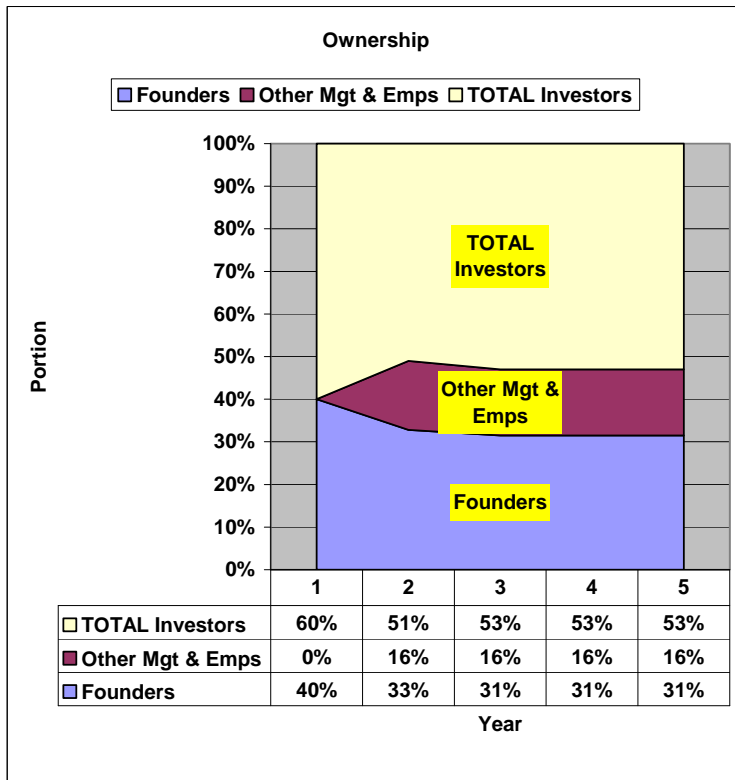


Figure 10: Company Ownership Graph

QuickUp Analysis of Wireless Sensor Network Startup Companies

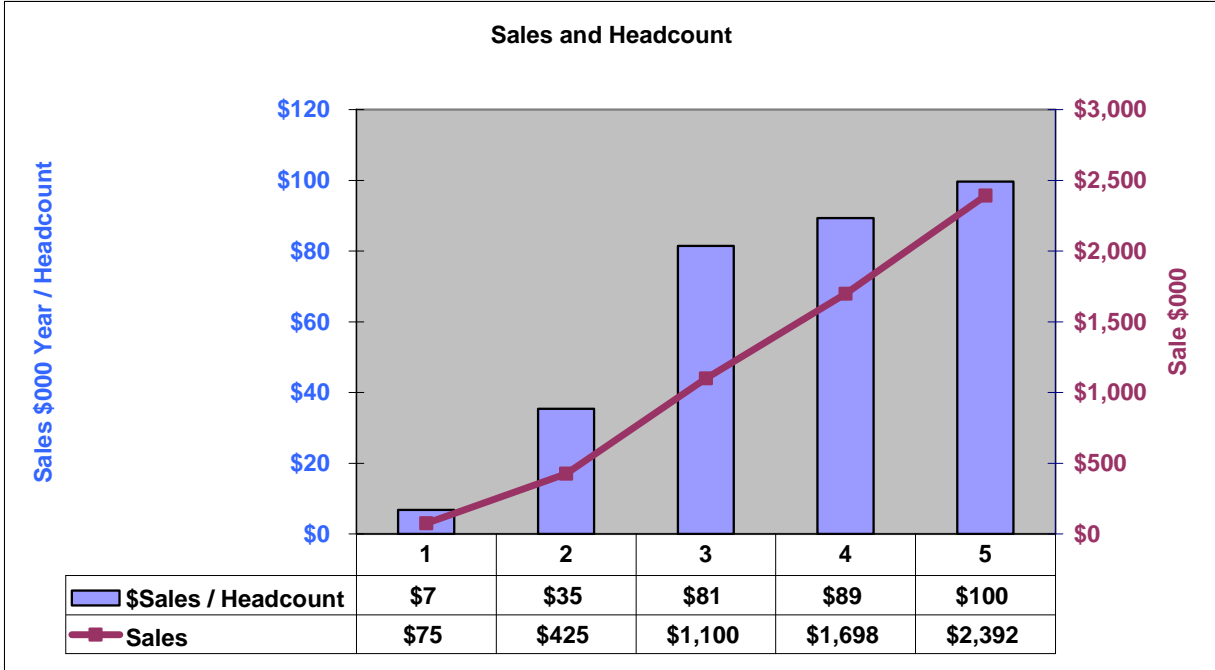


Figure 11: Graph of Sales and Headcount

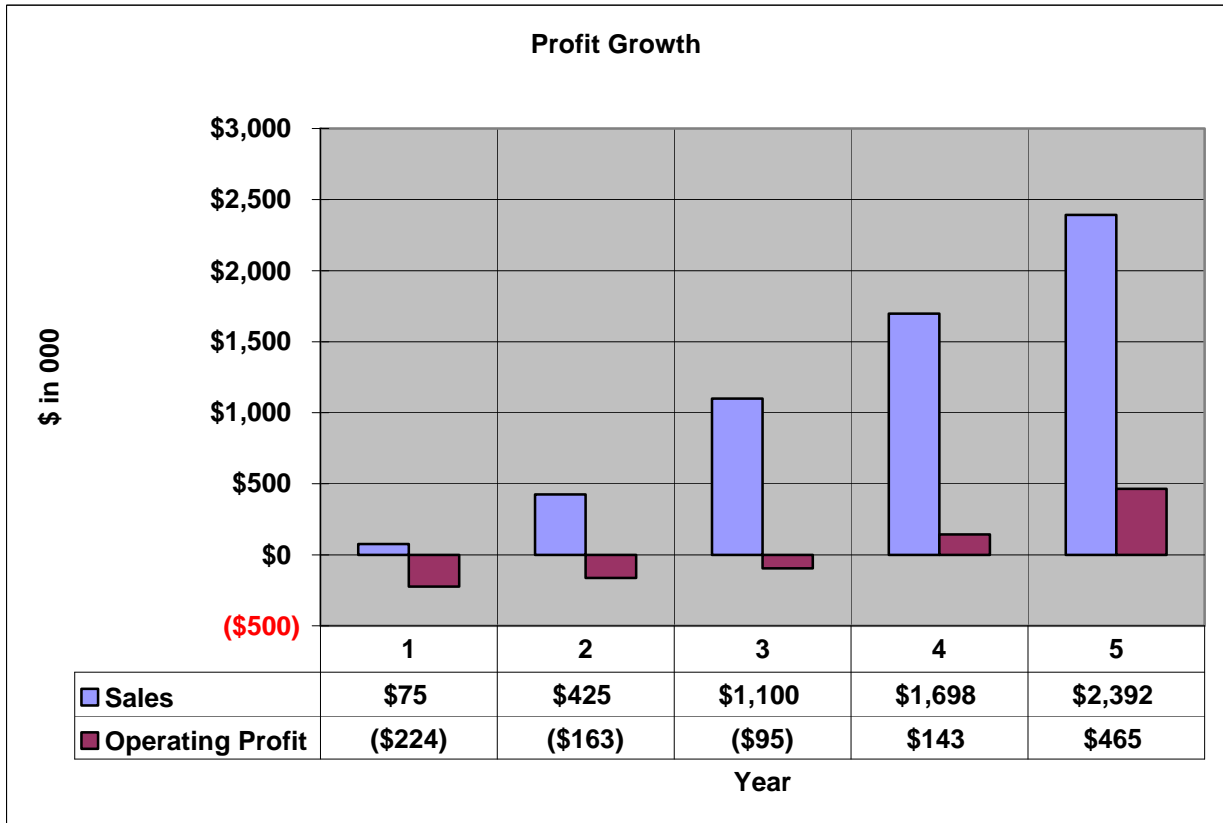


Figure 12: Graph of Profit Growth

6.4. Known Issues

In performing this analysis, several possible errors have been identified in the WiFiveO plan. Most result from numerical data not in agreement with WiFiveO's stated assumptions. The issues are outlined here.

- In 2005, WiFiveO is to sell 1000 ProMote units at \$75 dollars each. Their projected revenue for 2005 however is \$85,000.
- In 2005, WiFiveO obtains \$30,000 in "equipment" and this is noted on their balance sheet. However, nowhere is it indicated that they paid for this equipment. The costs are included in QuickUp as part of "R+D/Engineering" expenses.
- The 2005 expense per unit produced does not agree. WiFiveO uses \$30 per unit, but it should be \$35.
- It is not clear how the quantity discount on ProMote and SafetyNet work. Does it apply only to units purchased above 10,000, or to all units if the customer buys at least 10,000?
- The revenue projections for 2006 are significantly higher than what QuickUp calculates based on their assumptions.
- Values for Accounts Payable, Accounts Receivable, and Inventory seem arbitrary in the WiFiveO plan. In order to produce these numbers in QuickUp, the number of days to collect must be changed quite dramatically from year to year. More information on how these numbers were obtained would be useful. QuickUp's numbers are based on 30 days to pay/collect.

6.5. Conclusions

The QuickUp model provides excellent insight into the WiFiveO business plan. Even without the detailed valuation section and setting an IPO price, the reader can still see how much startup capital will be needed. QuickUp indicates that it will take considerably more capital than WiFiveO initially planned. WiFiveO predicted \$500,000 up front with \$250,000 in year three. QuickUp calculates that they will need \$600,000 up front, \$50,000 in year two, and \$270,000 in year three. The comparison has also addressed issues with WiFiveO's treatment of their own assumptions. When assumptions are laid down, they should be carefully followed.

7. The Ohio State University Project: GreenFang

7.1. Background

According to consumer advocacy group Kids and Cars, two children are killed each week in fatal backover accidents. These non-crash related fatalities occur when children are crushed by the backing up of vehicles with large blind spots, inattentive drivers, or both. In some cases, the blind spots of large vehicles may be as large as 51 feet.¹⁴ The Ohio State University

GreenFang team seeks to utilize wireless sensor technology to enter this market and potentially save many lives.

7.2. Existing Approaches

Backover injuries and fatalities are being addressed to a degree by automotive manufacturers; several types of systems currently exist as standard or optional equipment. Below is given a summary of current technology and various criticisms.

- Live Video – A video camera is attached to the rear of a vehicle and provides live feed of the blind area. This system provides extreme detail of anything behind a motor vehicle. However, a major drawback is the need for user concentration, i.e., if the driver is not paying attention an accident may still occur. In addition, these systems can be prohibitively expensive, especially for retrofitting in the aftermarket.
- Infrared – Another system in use is infrared detection. The temperature gradient between a person and the background is detected using infrared sensors. While these systems provide active alarms to the driver, they can be blinded by intense sunlight and cold weather conditions.
- Laser – Lasers can be directed from the back of a vehicle and reflected off objects to determine their distance. While this can be effective, it depends heavily on the reflectivity of the target, and so can be easily “fooled” by dark clothing.
- Microwave – Microwaves may also be used for detection. While they are not susceptible to dark clothing, they require either the car or the subject to be in motion. If both are stationary, this technique will not be effective.¹⁵

7.3. The GreenFang Solution and Proposed Use of Sensor Network

GreenFang proposes using an alternative approach to sensing children in the vehicle blind spot. The commercially available unit *Backstopper CA-5004 Reverse Parking Sensor*¹⁶ utilizes acoustic echolocation (sound waves) to find the position of an object behind the automobile. GreenFang is convinced that this method provides superior obstacle detection over competing methods discussed previously. It is unaffected by ambient light, temperature, or relative motion, and sports improved distance estimation over competing systems.

GreenFang uniquely proposes to use a 2-node wireless sensor network to relay data from the acoustic sensors to the main GUI unit inside the vehicle. The sensor nodes selected are commercially available TelosMote (TMote) units from MoteIV Corporation. See Figure 13 for a simplified block diagram of the connection. Configured in this way, GreenFang will possess the only backup solution on the market to fully integrate wireless sensor nodes into the design. This technique should offer several competitive advantages (and challenges) which will be discussed in Section 7.4. The reader is strongly encouraged to read the team’s Design Report detailing all technical aspects of the proposed solution.¹⁷

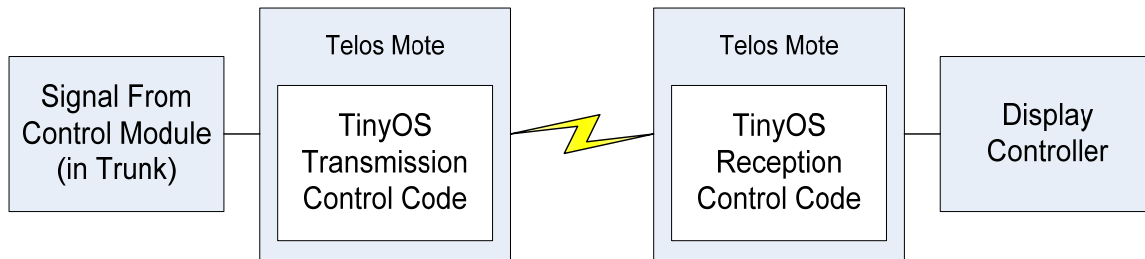


Figure 13: Basic Block Diagram of Solution

7.4. Customer Advantages of the GreenFang System

This section discusses the advantages to the customer gained using the proposed system. This parallels in many ways the advantages gained in general when adding wireless sensors to an existing market.

- Expandability – Use of the TMote units allows the capabilities of the product to exceed its current design. Future products could add collision detection or low visibility warnings, for example. The product could even be made to interface with existing computer systems within future vehicles.
- Maintainability – Use of the TinyOS software platform allows for the software detection of bugs or improvement in the product’s capabilities. For example, better processing algorithms may lead to enhanced detection of narrow objects such as parking meter poles.
- Ease of Use – The primary advantage of using GreenFang’s system is ease of setup compared to competitors. Setup concerns are a definite limiting factor when a customer considers any aftermarket product.

GreenFang’s experience in the area of sensor networks also creates the opportunity to develop new and unique safety products for the automobile and other applications. Innovation is essential to profitability in the rapidly changing sensor industry.

7.5. Barriers to Entry

GreenFang’s proposed vehicle safety system is certainly not the first backup warning system to be developed. Companies have been advancing this technology for years and new systems will continue to evolve. While the use of an acoustic system and wireless sensor technology helps to differentiate this product from others, competition still exists. Some companies have already implemented their own wireless solutions as well.

7.5.1. DesignTech International Inc.¹⁸

This company manufactures the BACK-UP SENSOR Ultrasonic Backup Guidance System. It bears many similarities to the GreenFang concept by using ultrasonic obstacle detection and a wireless link to the GUI in the front of the vehicle. In this sense, the product serves exactly the same function as GreenFang’s design, and so the BACK-UP SENSOR will provide competition for market share. This will be especially true regarding price comparisons due to the similarity between products.

Sales and Pricing – Currently DesignTech sells this product through online dealers. A well-known dealer is SmartHome.com, which specializes in electronic home improvement products. As of this writing, the BACK-UP SENSOR costs \$99.99 from their site.¹⁹

7.5.2. Costs

The GreenFang approach currently suffers from high per unit costs. This is due mainly to the use of retail products to integrate the final solution. See Figure 14 for a breakdown of GreenFang’s projected costs. In order to make this product realistic, either costs must be reduced or substantial functionality must be added in order to have an advantage to the customer.

Equipment	Cost Per Unit	Quantity	Total Cost
<i>Backstopper</i> Ultrasonic Back-Up Alarm	69.99	1	\$69.99
<i>Telos</i> Units	130	2	\$260.00
<i>Solio</i> Portable Hybrid Solar Charger	78.22	1	\$78.22
Miscellaneous (Wiring, etc.)	20	1	\$20.00
			\$428.21

Figure 14: Projected Costs per Unit

7.6. QuickUp Model

Following is a hypothetical QuickUp model of a startup company based on GreenFang’s design idea. Note that since the project is in the preliminary phases of development most figures are estimated. However, this should still assist the reader in understanding the structure of IPO based startup companies in general, and the amount of sales/personnel needed to make a company profitable.

QuickUp Analysis of Wireless Sensor Network Startup Companies

7.6.1. Sales Model

Year	1	2	3	4	5
SALES MODEL	\$ in 000 unless otherwise indicated				
SALES: TOTAL					
Average Sales Price \$ per Unit	\$750.00	\$750.00	\$750.00	\$750.00	\$750.00
Sales Units in 000	0.500	2.000	4.000	8.000	10.000
Sales	\$375	\$1,500	\$3,000	\$6,000	\$7,500
COST OF GOOD SOLD					
Production Cost per Unit Sold \$/Unit	\$428.00	\$400.00	\$350.00	\$325.00	\$300.00
Sales Units in 000	0.500	2.000	4.000	8.000	10.000
Production Cost of Units Sold	\$214	\$800	\$1,400	\$2,600	\$3,000
Manufacturing / Operations - Headcount	1	3	5	10	15
Manufacturing / Operations - \$/HC	\$40	\$42	\$44	\$46	\$48
Manufacturing / Operations - Dept Expense	\$40	\$126	\$220	\$460	\$720
Other Expenses - Mfg/Ops	\$1	\$2	\$3	\$4	\$5
Cost of Goods/Services Sold	\$255	\$928	\$1,623	\$3,064	\$3,725
Sales	\$375	\$1,500	\$3,000	\$6,000	\$7,500
Cost of Goods/Services Sold	\$255	\$928	\$1,623	\$3,064	\$3,725
Gross Margin	\$120	\$572	\$1,377	\$2,936	\$3,775
Sales	100%	100%	100%	100%	100%
Cost of Goods/Services Sold	68%	62%	54%	51%	50%
Gross Margin	32%	38%	46%	49%	50%

Figure 15: Sales Model

7.6.2. Operating Expenses

Year	1	2	3	4	5
Headcount	<i>Headcount: End of Year</i>				
R&D/Engineering	7	7	7	7	7
Sales & Marketing & Customer Support	2	4	8	10	10
Finance General & Administrative	1	1	1	1	1
TOTAL HEADCOUNT	11	15	21	28	33
<i>\$Sales / Headcount</i>	\$34	\$100	\$143	\$214	\$227
	<i>\$ in 000</i>				
Operating Expenses include the entire expenses per department divided by number of people.					
NOTE: Operating Expenses includes everything: wages, health insurance, travel, depreciation, share of rent, supplies, and outside services and more.					
Operating Expenses per Headcount per Year					
R&D/Engineering	\$80	\$82	\$84	\$86	\$88
Sales & Marketing & Customer Support	\$40	\$42	\$44	\$46	\$48
Sales Commission % Sales	0%	0%	0%	0%	0%
Finance General & Administrative	\$50	\$52	\$54	\$56	\$58
Operating Expenses per Department per year					
R&D/Engineering	\$560	\$574	\$588	\$602	\$616
Sales (with commissions) & Marketing & Customer Support	\$80	\$168	\$352	\$460	\$480
Finance General & Administrative	\$50	\$52	\$54	\$56	\$58
Operating Expenses	\$690	\$794	\$994	\$1,118	\$1,154

Figure 16: Operating Expenses

QuickUp Analysis of Wireless Sensor Network Startup Companies

7.6.3. Income Statement

	Year	1	2	3	4	5
Income Statement		\$ in 000				
Sales		\$375	\$1,500	\$3,000	\$6,000	\$7,500
Cost of Goods Sold		\$255	\$928	\$1,623	\$3,064	\$3,725
Gross Margin		\$120	\$572	\$1,377	\$2,936	\$3,775
<i>Percent of Sales</i>		32%	38%	46%	49%	50%
R&D/Engineering		\$560	\$574	\$588	\$602	\$616
Sales & Marketing & Customer Support		\$80	\$168	\$352	\$460	\$480
Finance General & Administrative		\$50	\$52	\$54	\$56	\$58
Operating Expenses		\$690	\$794	\$994	\$1,118	\$1,154
Operating Profit		(\$570)	(\$222)	\$383	\$1,818	\$2,621
<i>Percent of Sales</i>		-152%	-15%	13%	30%	35%
Total Interest Expense		\$0	\$0	\$0	\$0	\$0
Income Before Taxes		(\$570)	(\$222)	\$383	\$1,818	\$2,621
Provision for Income Taxes		0	0	0	493	917
Net Income		(\$570)	(\$222)	\$383	\$1,325	\$1,704
<i>Percent of Sales</i>		-152%	-15%	13%	22%	23%

Figure 17: Income Statement

QuickUp Analysis of Wireless Sensor Network Startup Companies

7.6.4. Balance Sheet

Year	1	2	3	4	5
Balance Sheet					
Assets					
Checking Account	\$1	\$1	\$1	\$1	\$1
Balancer: Surplus Cash	\$34	\$23	\$299	\$1,509	\$3,200
Receivables	\$31	\$123	\$247	\$493	\$616
Inventory	\$21	\$76	\$133	\$252	\$306
Current Assets	\$86	\$224	\$680	\$2,255	\$4,124
Equipment	\$32	\$55	\$82	\$111	\$136
Cumulative Depreciation	\$11	\$29	\$56	\$83	\$110
Net Equipment	\$21	\$26	\$26	\$28	\$26
Total Assets	\$108	\$250	\$706	\$2,283	\$4,150
Liabilities and Equity					
Bank Debt	\$0	\$0	\$0	\$0	\$0
Leases - Current Portion	\$0	\$0	\$0	\$0	\$0
Accounts Payable	\$78	\$142	\$215	\$344	\$401
Taxes Payable	\$0	\$0	\$0	\$123	\$229
Current Liabilities	\$78	\$142	\$215	\$467	\$630
Leases - Long Term Portion	\$0	\$0	\$0	\$0	\$0
Total Liabilities	\$78	\$142	\$215	\$467	\$630
Cumulative Stock Sold - Venture Capital \$00	\$600	\$900	\$900	\$900	\$900
Beginning Retained Earnings	\$0	(\$570)	(\$792)	(\$409)	\$916
Net Income this period	(\$570)	(\$222)	\$383	\$1,325	\$1,704
Cumulative Retained Earnings	(\$570)	(\$792)	(\$409)	\$916	\$2,620
Total Shareholders' Equity	\$30	\$108	\$491	\$1,816	\$3,520
Total Liabilities and Equity	\$108	\$250	\$706	\$2,283	\$4,150
Total Liabilities and Equity	\$108	\$250	\$706	\$2,283	\$4,150
Total Assets less Surplus Cash	\$74	\$227	\$407	\$774	\$950
Difference	\$34	\$23	\$299	\$1,509	\$3,200
Difference goes to Surplus Cash.					
Cash Flow					
\$ in 000					
Checking Account	\$1	\$1	\$1	\$1	\$1
Balancer: Surplus Cash	\$34	\$23	\$299	\$1,509	\$3,200
TOTAL CASH	\$35	\$24	\$300	\$1,510	\$3,201
Change in Cash	\$35	(\$11)	\$276	\$1,209	\$1,691
Financing:					
Change in Stock Sold	\$600	\$300	\$0	\$0	\$0
Change in Bank Debt	\$0	\$0	\$0	\$0	\$0
Change in Leasing	\$0	\$0	\$0	\$0	\$0
Change in Financing	\$600	\$300	\$0	\$0	\$0
Cash Flow from Operations	(\$565)	(\$311)	\$276	\$1,209	\$1,691

Figure 18: Balance Sheet

7.6.5. Company Valuation

Company Valuation

Chosen Company Valuation is:					
"Post-Money" = Total Company Value in \$	\$3	\$8	\$18	\$39	IPO \$52
Alternative Valuations:					
Sales	\$375	\$1,500	\$3,000	\$6,000	\$7,500
Multiple of Revenue	4.0	4.0	4.0	4.0	4.0
Company Valuation \$Millions	\$1.500	\$6	\$12	\$24	\$30
Net Income	(\$570)	(\$222)	\$383	\$1,325	\$1,704
Multiple of Net Income	33	33	33	33	33
Company Valuation \$Millions	(\$19)	(\$7)	\$13	\$44	\$56

Figure 19: Company Valuation

7.6.6. Investor ROI

Investors' Return on Investment

Year	1	2	3	4	5
\$ in 000 unless otherwise indicated					
Sales	\$375	\$1,500	\$3,000	\$6,000	\$7,500
New Stock Sold - Venture Capital \$000	\$600	\$300	\$0	\$0	\$0
Cumulative Stock Sold - Venture Capital \$00	\$600	\$900	\$900	\$900	\$900
"Pre-Money" = Total Company Value in Millions	\$2,400	\$7,700	\$18,000	\$39,000	\$52,000
New Stock Sold - Venture Capital \$000	\$600	\$300	\$0	\$0	\$0
"Post-Money" = Total Company Value in Millions	\$3,000	\$8,000	\$18,000	\$39,000	\$52,000
TOTAL COMPANY Shares - Fully Diluted (000)	1,875	1,948	1,948	1,948	1,948
Pre-Money Co Value / Share Fully Dilluted	\$1.60	\$4.11	\$9.24	\$20.02	\$26.69
Post-Money Co Value / Share Fully Dilluted	\$1.60	\$4.11	\$9.24	\$20.02	\$26.69
Investors' Return on Investment					
Investors' Multiple= (Year 5 \$/share)/(This Years' \$/share)					
1\$ invested this year will grow X times to = \$/Share in Year t					
Investors' Multiple (Times \$1 Invested)	16.7	6.5	2.9	1.3	1.0
Investors' ROI:					
\$1 grows to Year 5 \$/Share at this interest rate per year:					
Investors' ROI (Percent per Year) % p.a.	102%	87%	70%	33%	
Standard ROI (Percent per Year) % p.a.	100%	90%	70%	35%	0%

Figure 20: Investor ROI

QuickUp Analysis of Wireless Sensor Network Startup Companies

7.6.7. Company Ownership

Company Ownership

Year	1	2	3	4	5
Number of Shares in thousands 000	Number of shares in 000				
TOTAL Investors	375	448	448	448	448
TOTAL Non-Investors	1500	1500	1500	1500	1500
TOTAL COMPANY Shares - Fully Diluted (000)	1,875	1,948	1,948	1,948	1,948
Investors					
Preferred Series A	375	375	375	375	375
Preferred Series B		73	73	73	73
Preferred Series C			0	0	0
Preferred Series D				0	0
TOTAL Investors	375	448	448	448	448
Non-Investors					
Founders	1,000	1,000	1,000	1,000	1,000
Vice Presidents and other Executives	0	0	0	0	0
Directors	0	0	0	0	0
Managers	0	0	0	0	0
Employees	500	500	500	500	500
Total Management & Employees	1,500	1,500	1,500	1,500	1,500
Contractors	0	0	0	0	0
Support Services	0	0	0	0	0
Other Non-Investors	0	0	0	0	0
Total Non-Mgt & Employees	0	0	0	0	0
TOTAL Non-Investors	1,500	1,500	1,500	1,500	1,500
Portion Owned					
TOTAL Investors	20.0%	23.0%	23.0%	23.0%	23.0%
TOTAL Non-Investors	80.0%	77.0%	77.0%	77.0%	77.0%
TOTAL COMPANY Shares - Fully Diluted (000)	100.0%	100.0%	100.0%	100.0%	100.0%
Investors					
Preferred Series A	20.0%	19.3%	19.3%	19.3%	19.3%
Preferred Series B	0.0%	3.8%	3.8%	3.8%	3.8%
Preferred Series C	0.0%	0.0%	0.0%	0.0%	0.0%
Preferred Series D	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL Investors	20.0%	23.0%	23.0%	23.0%	23.0%
Non-Investors					
Founders	53.3%	51.3%	51.3%	51.3%	51.3%
Vice Presidents and other Executives	0.0%	0.0%	0.0%	0.0%	0.0%
Directors	0.0%	0.0%	0.0%	0.0%	0.0%
Managers	0.0%	0.0%	0.0%	0.0%	0.0%
Employees	26.7%	25.7%	25.7%	25.7%	25.7%
Total Management & Employees	80.0%	77.0%	77.0%	77.0%	77.0%
Contractors	0.0%	0.0%	0.0%	0.0%	0.0%
Support Services	0.0%	0.0%	0.0%	0.0%	0.0%
Other Non-Investors	0.0%	0.0%	0.0%	0.0%	0.0%
Total Non-Mgt & Employees	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL Non-Investors	80.0%	77.0%	77.0%	77.0%	77.0%

Figure 21: Company Ownership

QuickUp Analysis of Wireless Sensor Network Startup Companies

7.6.8. Wealth Allocation

Wealth

	\$ in 000 unless otherwise indicated				
Year	1	2	3	4	5
"Post-Money" = Total Company Value in \$Millions	\$3	\$8	\$18	\$39	\$52
TOTAL COMPANY Shares - Fully Diluted (000)	1,875	1,948	1,948	1,948	1,948
Co Value / Share Fully Dilluted	\$1.60	\$4.11	\$9.24	\$20.02	\$26.69
TOTAL Investors	\$600	\$1,840	\$4,140	\$8,970	\$11,960
TOTAL Non-Investors	\$2,400	\$6,160	\$13,860	\$30,030	\$40,040
TOTAL COMPANY Shares - Fully Diluted (000)	3000	8000	18000	39000	52000

Investors

Preferred Series A	\$1	\$2	\$3	\$8	\$10
Preferred Series B	\$0	\$0	\$1	\$1	\$2
Preferred Series C	\$0	\$0	\$0	\$0	\$0
Preferred Series D	\$0	\$0	\$0	\$0	\$0
TOTAL Investors	\$1	\$2	\$4	\$9	\$12

Non-Investors

Founders	\$2	\$4	\$9	\$20	\$27
Vice Presidents and other Executives	\$0	\$0	\$0	\$0	\$0
Directors	\$0	\$0	\$0	\$0	\$0
Managers	\$0	\$0	\$0	\$0	\$0
Employees	\$1	\$2	\$5	\$10	\$13
Total Management & Employees	\$2	\$6	\$14	\$30	\$40
Contractors	\$0	\$0	\$0	\$0	\$0
Support Services	\$0	\$0	\$0	\$0	\$0
Other Non-Investors	\$0	\$0	\$0	\$0	\$0
Total Non-Mgt & Employees	\$0	\$0	\$0	\$0	\$0
TOTAL Non-Investors	\$2	\$6	\$14	\$30	\$40

Figure 22: Wealth Allocation

7.6.9. Graphs

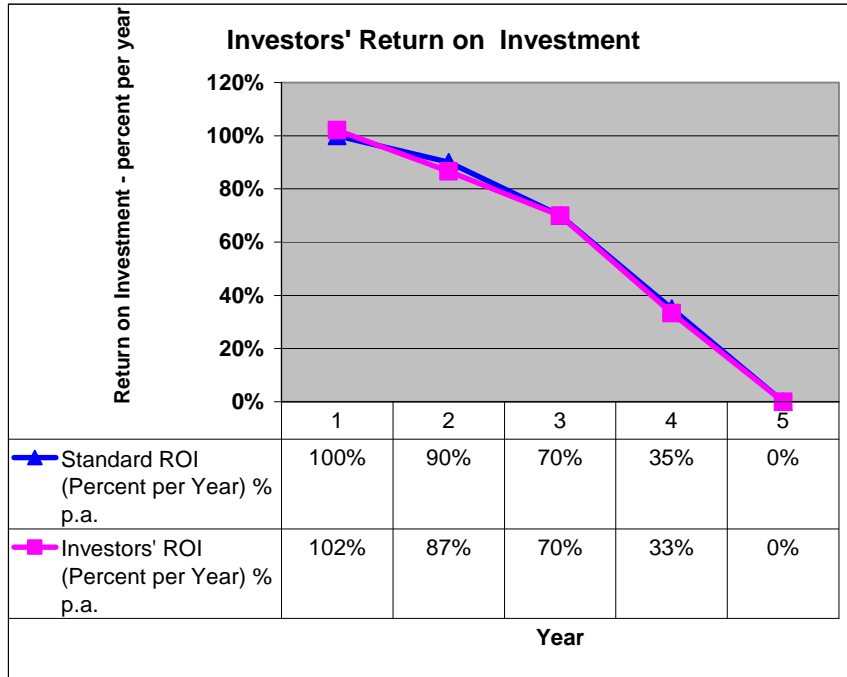


Figure 23: Investor ROI Graph

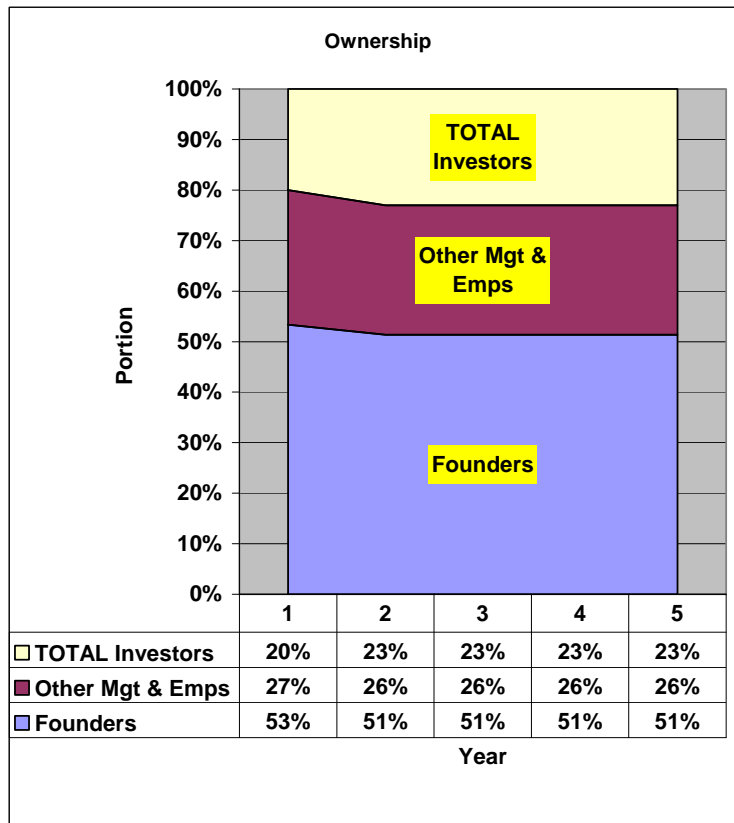


Figure 24: Graph of Ownership

QuickUp Analysis of Wireless Sensor Network Startup Companies

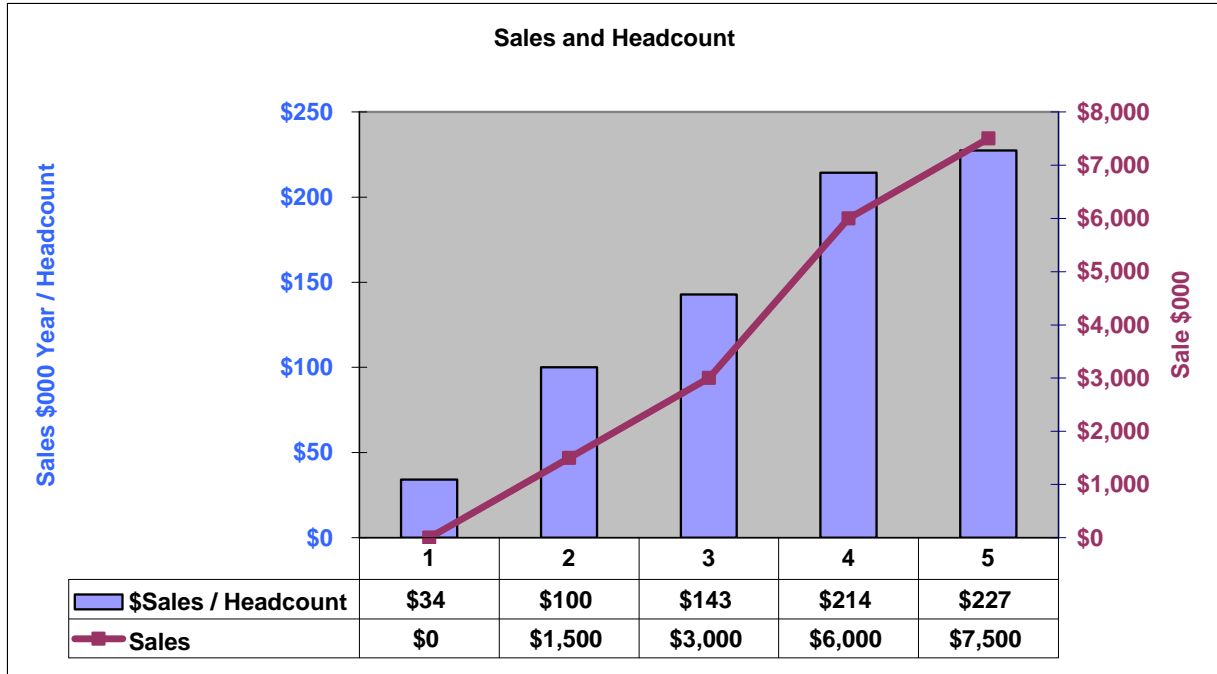


Figure 25: Graph of Sales and Headcount

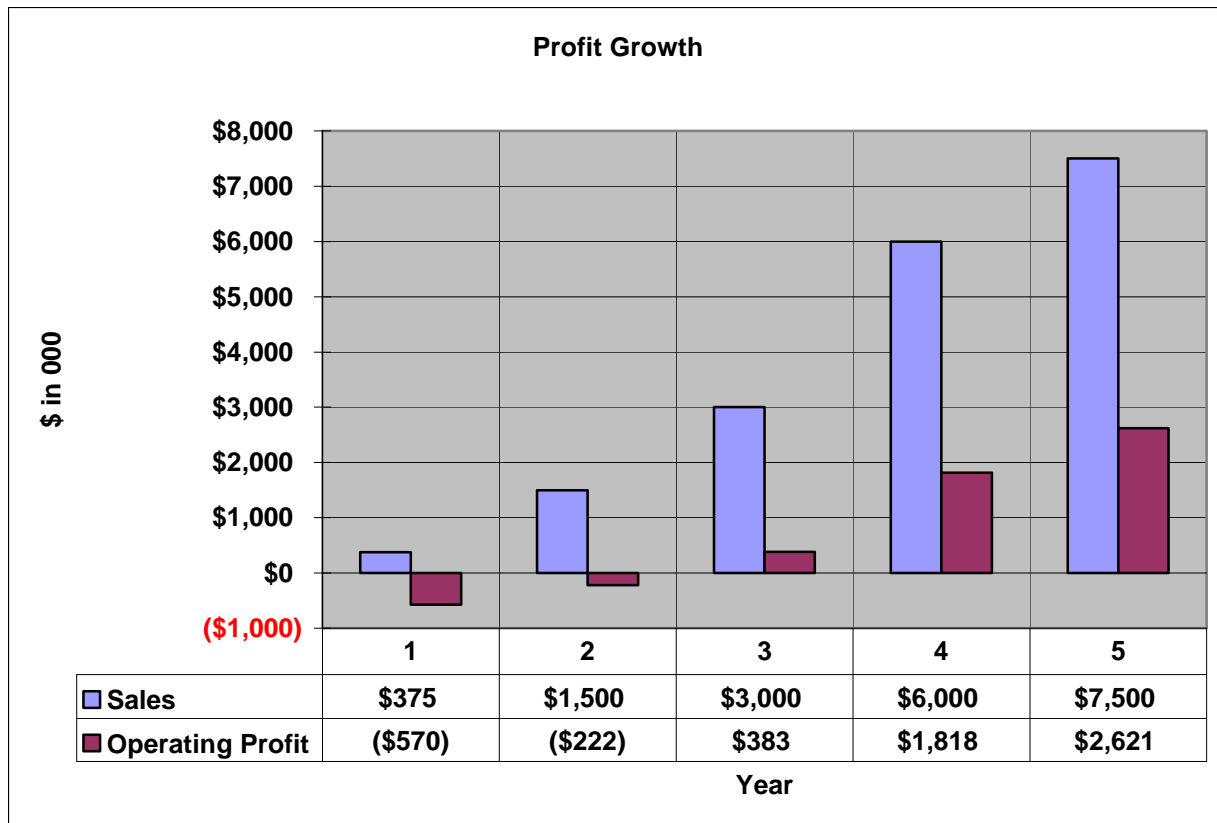


Figure 26: Graph of Profit Growth

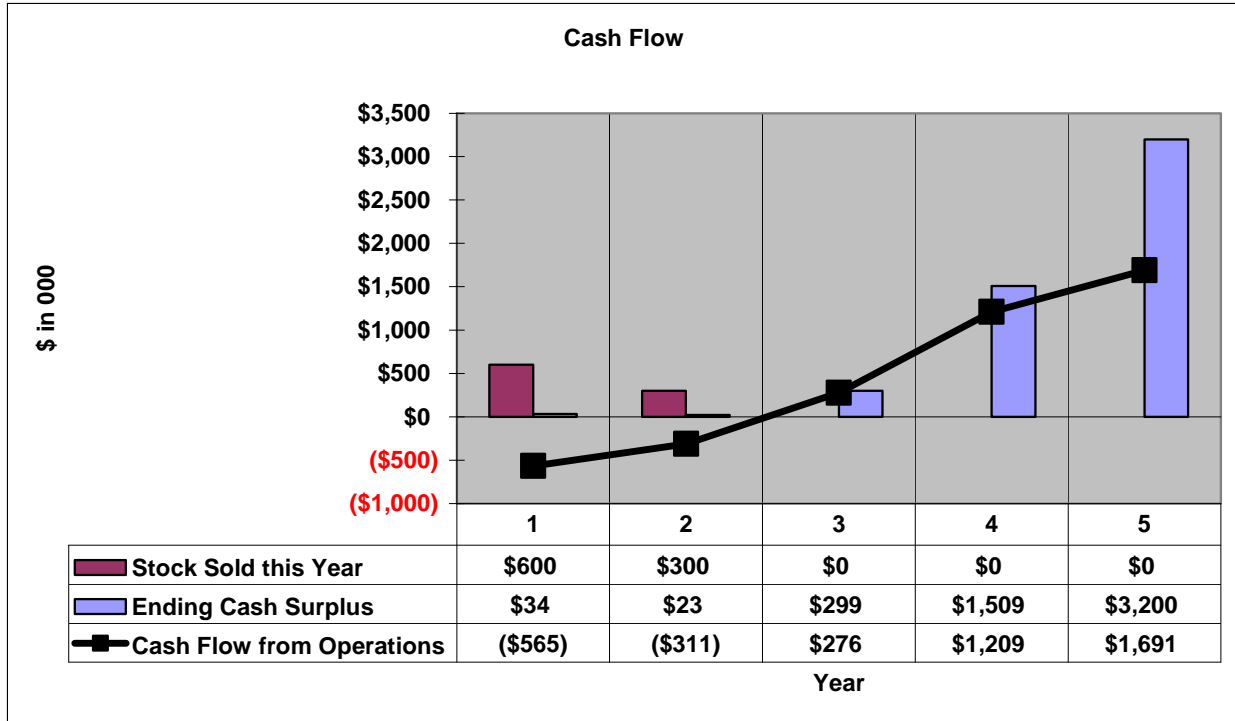


Figure 27: Graph of Cash Flow

7.7. Conclusions

This QuickUp sheet fully outlines a possible scenario for GreenFang to begin a startup company based on their wireless backup system. This information should prove valuable as a starting point for forming a company with this product. Following are observations based on the QuickUp results.

In Section 7.6.7: Company Ownership, observe that venture capitalists own only about 20% of the total company shares. This may be an indication that sales figures are too optimistic. These values should be adjusted as GreenFang further develops their product, becomes aware of costs, and senses how many units may be sold each year. Another possible explanation is the relatively low number of personnel assigned to this company. It may be discovered that more personnel are needed to manufacture the backup units, or to design/test product etc.

8. The Ohio State University Project: Accel to 3-D

8.1. Background

The Accel to 3-D project team intends to create a wireless sensor network with the ability to track the position, acceleration, and trajectory of an object in three-dimensional space. The current motivation for this capability is a need for accurate modeling of complex motion. Specifically, such a sensor network can model the position of various parts of the human body

and the motion of objects in sports. According to Accel, this information has special value in “sports video games, athletic training, sports officiating, and sports entertainment.”²⁰

8.2. Existing Technology

“Wearable” wireless networks are those that use sensor nodes so small that they can be placed on various parts of the body. Several types of sensor nodes exist today for this purpose. These units are designed for extremely small size and power consumption. While they may be used for a variety of purposes, they are similar to the Accel concept because they are attached to the body. There are several of these sensors on the market; following are some examples.

- MICA2DOT – These tiny, 25mm diameter nodes are designed for wearable computer and hard to reach places. They are manufactured by Crossbow Technology. See Section 4.3 for more information on Crossbow.
- Teco Particle – Another example of an extremely small 1cm³ sensor with all functions integrated onto one tiny board.²¹
- Eco – This wearable sensor was developed at the University of California-Irvine. It has been demonstrated on pre term infants and in interactive dance. The primary focus is on keeping power consumption low while increasing processing power and network transmission capability.²²

8.3. Accel Solution and Use of Sensor Network

The sensor node proposed here to track the motion of an object is the G-Link Wireless Accelerometer Node. The technology is produced by MicroStrain Inc. Refer to Section 4.5 for further information on the company and its sensing technology. Accel intends to use acceleration data from these sensors to calculate velocity and position. Refer to Figure 28 for a general layout of Accel’s system.

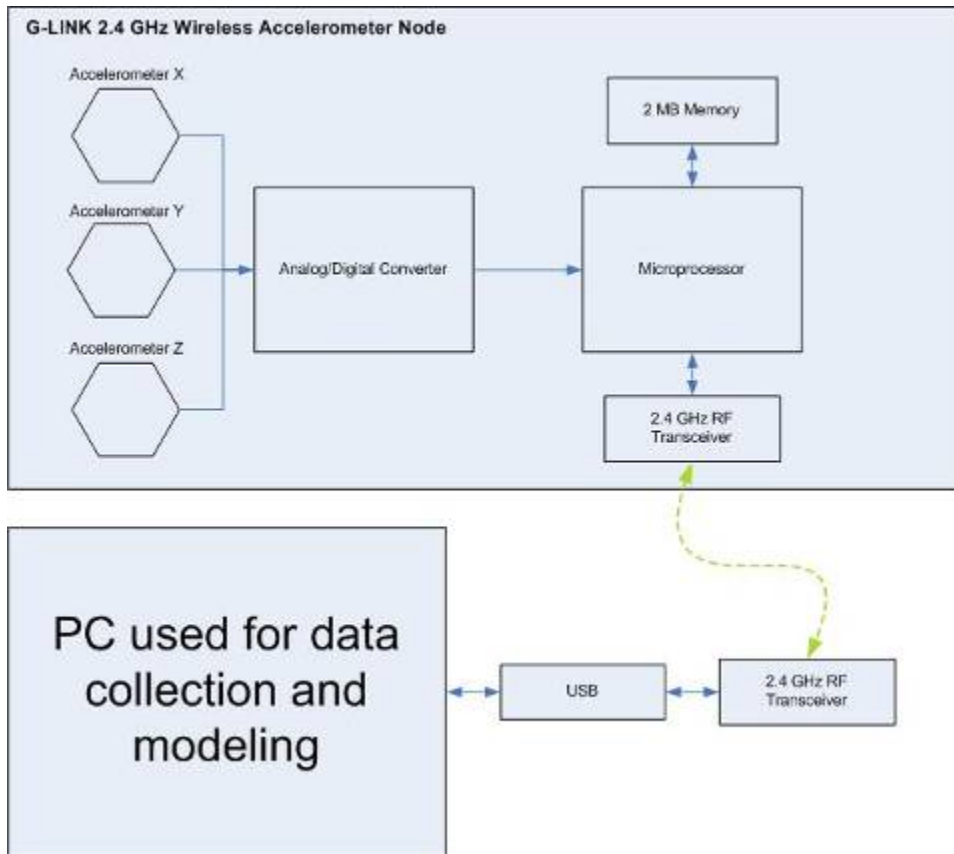


Figure 28: Block Diagram of Accel System

The sensor nodes are to be attached to the object to be measured; in this case either the human body or some object such as a baseball. The acceleration data is gathered from the sensors by MicroStrain’s Agile-Link software package and USB antenna system.

8.4. Existing Companies / Barriers to Entry

As previously described, the Accel to 3-D project has two product goals. The first is to utilize a sensor network to model the positioning and acceleration of the human body. In this sense, it is an instance of type of personal area network (PAN) known as a Personal Body Area Network (PBAN). There is much research into these “wearable networks,” and for now, they are mainly in the early phases of development. One the most ambitious research projects at this point is the Human++ project. The goal is to develop generic technologies “to improve the functionality of therapeutic and diagnostic devices.”²³ Using this technology for tracking the movements of a baseball bat or tennis racket would represent an opportunity to market this technology to the public. As of this writing, there appear to be no companies attempting this approach. Accel to 3-D’s plan for using only a few sensors would limit the amount of human motion that could be modeled. However, as mentioned in their report, the swing of a racket or bat would be feasible and thus a startup offering this product/service could be pursued.

8.4.1. Sports Sensors Inc.

Accel to 3-D’s second design idea is to use the same MicroStrain-based system for tracking the position and trajectory of an object in a sporting event. Their system would allow for real time tracking of a baseball or tennis ball, for example. For this product approach there exists competition, since knowing the speed of a baseball when thrown or hit has always been valuable information. Sports Sensors Inc. is just one example of a company using a classical approach to obtaining this data. Their technology uses the standard radar tracking technique. Their baseball glove-mounted sensor calculates the speed of a baseball when thrown at the glove.²⁴ While this technology differs significantly from Accel’s design, it gathers similar data and represents the mainstream approach. Therefore, Accel will compete with similar companies for market share. The customer must also be convinced that Accel to 3-D offers real benefits over established technology.

8.4.2. Cost

The Accel project will involve a high cost to produce a single product. Details can be found in Figure 29.²⁵ Note that these figures represent initial development costs and not necessarily a price to create a unit in mass production. However, on inspection it is obvious that the high cost of the sensor technology implies that this product must offer a significant benefit to the purchaser and will likely not appeal to the mass-market consumer.

Table 8.1: Estimated Costs
Team: Accel to 3-D

Item	Qty	Part No.	Cost Ea.	Total Cost
Team Work Hours	150	N/A	\$0.00	\$0.00
MicroStrain Package	1	3023-9006	\$1,995.00	\$1,995.00
Football*	2	2226909	\$19.99	\$39.98
Basketball*	2	1912103	\$19.99	\$39.98
12 Tennis Balls*	1	2143495	\$9.99	\$9.99
Baseball*	2	1814798	\$3.99	\$7.98
Total				\$2,092.93

*Prices and part numbers are for Dick's Sporting Goods Store

Figure 29: Table of Accel to 3D Product Costs

8.5. Advantages

The Accel project offers advantages despite its high cost. Consumers will certainly be turned away by this aspect. However, the functionality provided by this technology will not benefit the average consumer the way a product such as GreenFang’s sensor system would. Some possible advantages of the Accel project are outlined here.

8.5.1. Expandability / Adaptability

As with virtually all wireless sensor network products, this project will offer opportunities for expandability and upgradeability. In this case, it is a benefit to Accel as a company. The current project suffers from loosely defined goals and so a dedication to continued research and product improvement is needed. With this approach, products and services stemming from the initial concept can be refined for maximum profitability for the company. Value for the consumer will also be at the highest level possible, and the industries where sales are sought (i.e., sports recreation, medical, etc.) can be expanded.

8.5.2. Potential for Service Component

The interest in using Accel's technology for recreational and professional sports purposes opens the opportunity for a service offering from the company. Unlike the GreenFang group, Accel's offering to the consumer does not have to be a single sale of a product. When modeling human movement, for example, consulting on proper setup and placement of sensors, tech bench setup, and data analysis services can be offered. In fact, the entire company model can be based on consulting rather than sales of wireless units (for human movement purposes). A service-based company should be able to justify the high cost of the Accel equipment, and such consultations would be of interest to professional sports teams or other groups interested in high performance.

8.6. QuickUp Model

8.6.1. Sales Model

	Year	1	2	3	4	5
SALES MODEL						
\$ in 000 unless otherwise indicated						
SALES: TOTAL						
Average Sales Price \$ per Unit		\$5,000.00	\$5,454.00	\$5,454.00	\$5,348.00	\$5,192.00
Sales Units in 000		0.001	0.550	1.100	2.150	5.200
Sales		\$5	\$3,000	\$5,999	\$11,498	\$26,998
COST OF GOOD SOLD						
Production Cost per Unit Sold \$/Unit		\$2,500.00	\$2,400.00	\$2,300.00	\$2,200.00	\$2,000.00
Sales Units in 000		0.001	0.550	1.100	2.150	5.200
Production Cost of Units Sold		\$3	\$1,320	\$2,530	\$4,730	\$10,400
Manufacturing / Operations - Headcount		2	5	6	7	8
Manufacturing / Operations - \$/HC		\$80	\$82	\$84	\$86	\$90
Manufacturing / Operations - Dept Expenses		\$160	\$410	\$504	\$602	\$720
Other Expenses - Mfg/Ops		\$1	\$2	\$3	\$4	\$5
Cost of Goods/Services Sold		\$164	\$1,732	\$3,037	\$5,336	\$11,125
Sales		\$5	\$3,000	\$5,999	\$11,498	\$26,998
Cost of Goods/Services Sold		\$164	\$1,732	\$3,037	\$5,336	\$11,125
Gross Margin		(\$159)	\$1,268	\$2,962	\$6,162	\$15,873
Sales		100%	100%	100%	100%	100%
Cost of Goods/Services Sold		3270%	58%	51%	46%	41%
Gross Margin		-3170%	42%	49%	54%	59%

Figure 30: Accel to 3-D Sales Model

QuickUp Analysis of Wireless Sensor Network Startup Companies

8.6.2. Operating Expenses

	Year	1	2	3	4	5
Headcount	<i>Headcount: End of Year</i>					
R&D/Engineering		10	20	25	30	35
Sales & Marketing & Customer Support		2	10	15	20	30
Finance General & Administrative		3	3	3	3	3
TOTAL HEADCOUNT		17	38	49	60	76
<i>\$Sales / Headcount</i>		\$0	\$79	\$122	\$192	\$355

\$ in 000

Operating Expenses include the entire expenses per department divided by number of people.

NOTE: Operating Expenses includes everything: wages, health insurance, travel, depreciation, share of rent, supplies, and outside services and more.

Operating Expenses per Headcount per Year

R&D/Engineering	\$160	\$170	\$160	\$150	\$140
Sales & Marketing & Customer Support	\$80	\$90	\$100	\$110	\$100
Sales Commission % Sales	0%	0%	0%	0%	0%
Finance General & Administrative	\$50	\$60	\$70	\$80	\$80

Operating Expenses per Department per year

R&D/Engineering	\$1,600	\$3,400	\$4,000	\$4,500	\$4,900
Sales (with commissions) & Marketing & Cust. Support	\$160	\$900	\$1,500	\$2,200	\$3,000
Finance General & Administrative	\$150	\$180	\$210	\$240	\$240
Operating Expenses	\$1,910	\$4,480	\$5,710	\$6,940	\$8,140

Figure 31: Accel to 3-D Operating Expenses

8.6.3. Income Statement

	Year	1	2	3	4	5
Income Statement		\$ in 000				
Sales		\$5	\$3,000	\$5,999	\$11,498	\$26,998
Cost of Goods Sold		\$164	\$1,732	\$3,037	\$5,336	\$11,125
Gross Margin		(\$159)	\$1,268	\$2,962	\$6,162	\$15,873
<i>Percent of Sales</i>		-3170%	42%	49%	54%	59%
R&D/Engineering		\$1,600	\$3,400	\$4,000	\$4,500	\$4,900
Sales & Marketing & Customer Support		\$160	\$900	\$1,500	\$2,200	\$3,000
Finance General & Administrative		\$150	\$180	\$210	\$240	\$240
Operating Expenses		\$1,910	\$4,480	\$5,710	\$6,940	\$8,140
Operating Profit		(\$2,069)	(\$3,212)	(\$2,748)	(\$778)	\$7,733
<i>Percent of Sales</i>		-41370%	-107%	-46%	-7%	29%
Total Interest Expense		\$0	\$0	\$0	\$0	\$0
Income Before Taxes		(\$2,069)	(\$3,212)	(\$2,748)	(\$778)	\$7,733
Provision for Income Taxes		0	0	0	0	0
Net Income		(\$2,069)	(\$3,212)	(\$2,748)	(\$778)	\$7,733
<i>Percent of Sales</i>		-41370%	-107%	-46%	-7%	29%

Figure 32: Accel to 3-D Income Statement

QuickUp Analysis of Wireless Sensor Network Startup Companies

8.6.4. Balance Sheet

Balance Sheet	Year	1	2	3	4	5
Assets	\$ in 000					
Checking Account		\$10	\$10	\$10	\$10	\$10
Balancer: Surplus Cash		\$529	\$547	\$590	\$582	\$7,144
Receivables		\$0	\$247	\$493	\$945	\$2,219
Inventory		\$13	\$142	\$250	\$439	\$914
Current Assets		\$553	\$946	\$1,343	\$1,976	\$10,288
Equipment		\$73	\$162	\$189	\$216	\$237
Cumulative Depreciation		\$24	\$78	\$141	\$189	\$214
Net Equipment		\$49	\$84	\$48	\$27	\$23
Total Assets		\$602	\$1,030	\$1,391	\$2,003	\$10,311
Liabilities and Equity						
Bank Debt		\$0	\$0	\$0	\$0	\$0
Leases - Current Portion		\$0	\$0	\$0	\$0	\$0
Accounts Payable		\$170	\$511	\$719	\$1,009	\$1,583
Taxes Payable		\$0	\$0	\$0	\$0	\$0
Current Liabilities		\$170	\$511	\$719	\$1,009	\$1,583
Leases - Long Term Portion		\$0	\$0	\$0	\$0	\$0
Total Liabilities		\$170	\$511	\$719	\$1,009	\$1,583
Cumulative Stock Sold - Venture Capital \$000		\$2,500	\$5,800	\$8,700	\$9,800	\$9,800
Beginning Retained Earnings		\$0	(\$2,069)	(\$5,281)	(\$8,028)	(\$8,806)
Net Income this period		(\$2,069)	(\$3,212)	(\$2,748)	(\$778)	\$7,733
Cumulative Retained Earnings		(\$2,069)	(\$5,281)	(\$8,028)	(\$8,806)	(\$1,073)
Total Shareholders' Equity		\$432	\$519	\$672	\$994	\$8,727
Total Liabilities and Equity		\$602	\$1,030	\$1,391	\$2,003	\$10,311
Total Liabilities and Equity		\$602	\$1,030	\$1,391	\$2,003	\$10,311
Total Assets less Surplus Cash		\$73	\$483	\$800	\$1,421	\$3,166
Difference		\$529	\$547	\$590	\$582	\$7,144

Difference goes to Surplus Cash.

Figure 33: Accel to 3-D Balance Sheet

QuickUp Analysis of Wireless Sensor Network Startup Companies

8.6.5. Company Valuation

\$ in 000 unless otherwise indicated

Accel to 3-D Corporation

Year	1	2	3	4	5
Company Valuation					
Chosen Company Valuation is: "Post-Money" = Total Company Value in \$Millions	\$4	\$15	\$40	\$80	IPO \$108
Alternative Valuations:					
Sales	\$5	\$3,000	\$5,999	\$11,498	\$26,998
Multiple of Revenue	4.0	4.0	4.0	4.0	4.0
Company Valuation \$Millions	\$0.020	\$12	\$24	\$46	\$108
Net Income	(\$2,069)	(\$3,212)	(\$2,748)	(\$778)	\$7,733
Multiple of Net Income	33	33	33	33	33
Company Valuation \$Millions	(\$68)	(\$106)	(\$91)	(\$26)	\$255

Figure 34: Accel to 3-D Company Valuation

8.6.6. Investor ROI

Investors' Return on Investment

Year	1	2	3	4	5
\$ in 000 unless otherwise indicated					
Sales	\$5	\$3,000	\$5,999	\$11,498	\$26,998
New Stock Sold - Venture Capital \$000	\$2,500	\$3,300	\$2,900	\$1,100	\$0
Cumulative Stock Sold - Venture Capital \$000	\$2,500	\$5,800	\$8,700	\$9,800	\$9,800
"Pre-Money" = Total Company Value in Millions	\$1,500	\$11,700	\$37,100	\$78,900	\$108,000
New Stock Sold - Venture Capital \$000	\$2,500	\$3,300	\$2,900	\$1,100	\$0
"Post-Money" = Total Company Value in Millions	\$4,000	\$15,000	\$40,000	\$80,000	\$108,000
TOTAL COMPANY Shares - Fully Diluted (000)	3,200	4,860	5,240	5,313	5,240
Pre-Money Co Value / Share Fully Dilluted	\$1.25	\$3.09	\$7.63	\$15.06	\$20.61
Post-Money Co Value / Share Fully Dilluted	\$1.25	\$3.09	\$7.63	\$15.06	\$20.61
Investors' Return on Investment					
Investors' Multiple= (Year 5 \$/share)/(This Years' \$/share)					
1\$ invested this year will grow X times to = \$/Share in Year 5					
Investors' Multiple (Times \$1 Invested)	16.5	6.7	2.7	1.4	1.0
Investors' ROI:					
\$1 grows to Year 5 \$/Share at this interest rate per year:					
Investors' ROI (Percent per Year) % p.a.	102%	88%	64%	37%	0%
Standard ROI (Percent per Year) % p.a.	100%	90%	70%	35%	0%

Figure 35: Accel to 3-D Investor ROI

8.6.7. Company Ownership

Company Ownership

	Year	1	2	3	4	5
Number of Shares in thousands 000						
			Number of shares in 000			
TOTAL Investors		2,000	3,069	3,449	3,522	3,449
TOTAL Non-Investors		1200	1790.991	1790.99099	1790.991	1790.991
TOTAL COMPANY Shares - Fully Diluted (000)		3,200	4,860	5,240	5,313	5,240
Investors						
Preferred Series A		2,000	2,000	2,000	2,000	2,000
Preferred Series B			1,069	1,069	1,069	1,069
Preferred Series C				380	380	380
Preferred Series D					73	0
TOTAL Investors		2,000	3,069	3,449	3,522	3,449
Non-Investors						
Founders		1,200	1,200	1,200	1,200	1,200
Vice Presidents and other Executives		0	360	360	360	360
Directors		0	144	144	144	144
Managers		0	58	58	58	58
Employees		0	29	29	29	29
Total Management & Employees		1,200	1,791	1,791	1,791	1,791
Contractors		0	0	0	0	0
Support Services		0	0	0	0	0
Other Non-Investors		0	0	0	0	0
Total Non-Mgt & Employees		0	0	0	0	0
TOTAL Non-Investors		1,200	1,791	1,791	1,791	1,791
Portion Owned						
TOTAL Investors		62.5%	63.2%	65.8%	66.3%	65.8%
TOTAL Non-Investors		37.5%	36.8%	34.2%	33.7%	34.2%
TOTAL COMPANY Shares - Fully Diluted (000)		100.0%	100.0%	100.0%	100.0%	100.0%
Investors						
Preferred Series A		62.5%	41.2%	38.2%	37.6%	38.2%
Preferred Series B		0.0%	22.0%	20.4%	20.1%	20.4%
Preferred Series C		0.0%	0.0%	7.3%	7.2%	7.3%
Preferred Series D		0.0%	0.0%	0.0%	1.4%	0.0%
TOTAL Investors		62.5%	63.2%	65.8%	66.3%	65.8%
Non-Investors						
Founders		37.5%	24.7%	22.9%	22.6%	22.9%
Vice Presidents and other Executives		0.0%	7.4%	6.9%	6.8%	6.9%
Directors		0.0%	3.0%	2.8%	2.7%	2.8%
Managers		0.0%	1.2%	1.1%	1.1%	1.1%
Employees		0.0%	0.6%	0.6%	0.5%	0.6%
Total Management & Employees		37.5%	36.8%	34.2%	33.7%	34.2%
Contractors		0.0%	0.0%	0.0%	0.0%	0.0%
Support Services		0.0%	0.0%	0.0%	0.0%	0.0%
Other Non-Investors		0.0%	0.0%	0.0%	0.0%	0.0%
Total Non-Mgt & Employees		0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL Non-Investors		37.5%	36.8%	34.2%	33.7%	34.2%

Figure 36: Accel to 3-D Company Ownership

QuickUp Analysis of Wireless Sensor Network Startup Companies

8.6.8. Wealth

Wealth

	\$ in 000 unless otherwise indicated				
Year	1	2	3	4	5
"Post-Money" = Total Company Value in \$Millions	\$4	\$15	\$40	\$80	\$108
TOTAL COMPANY Shares - Fully Diluted (000)	3,200	4,860	5,240	5,313	5,240
Co Value / Share Fully Dilluted	\$1.25	\$3.09	\$7.63	\$15.06	\$20.61
TOTAL Investors	\$2,500	\$9,473	\$26,329	\$53,033	\$71,088
TOTAL Non-Investors	\$1,500	\$5,527	\$13,671	\$26,967	\$36,912
TOTAL COMPANY Shares - Fully Diluted (000)	4000	15000	40000	80000	108000

Investors	\$Millions				
Preferred Series A	\$2.50	\$6.17	\$15.27	\$30.11	\$41.22
Preferred Series B	\$0.00	\$3.30	\$8.16	\$16.10	\$22.04
Preferred Series C	\$0.00	\$0.00	\$2.90	\$5.72	\$7.83
Preferred Series D	\$0.00	\$0.00	\$0.00	\$1.10	\$0.00
TOTAL Investors	\$2.50	\$9.47	\$26.33	\$53.03	\$71.09

Non-Investors	\$Millions				
Founders	\$1.50	\$3.70	\$9.16	\$18.07	\$24.73
Vice Presidents and other Executives	\$0.00	\$1.11	\$2.75	\$5.43	\$7.43
Directors	\$0.00	\$0.44	\$1.10	\$2.17	\$2.97
Managers	\$0.00	\$0.18	\$0.44	\$0.87	\$1.19
Employees	\$0.00	\$0.09	\$0.22	\$0.43	\$0.59
Total Management & Employees	\$1.50	\$5.53	\$13.67	\$26.97	\$36.91
Contractors	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Support Services	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Other Non-Investors	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Non-Mgt & Employees	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL Non-Investors	\$1.50	\$5.53	\$13.67	\$26.97	\$36.91

Figure 37: Accel to 3-D Wealth

8.6.9. Graphs

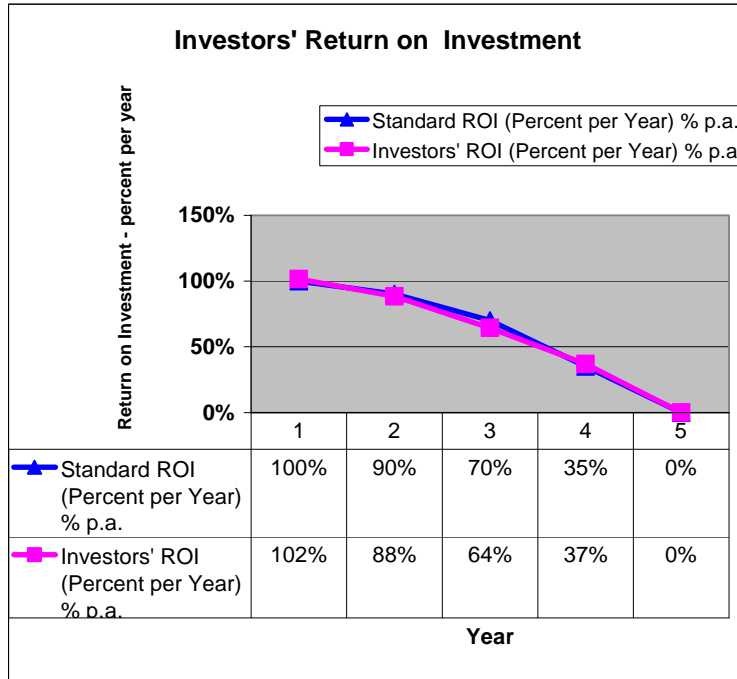


Figure 38: Accel to 3-D ROI Curve

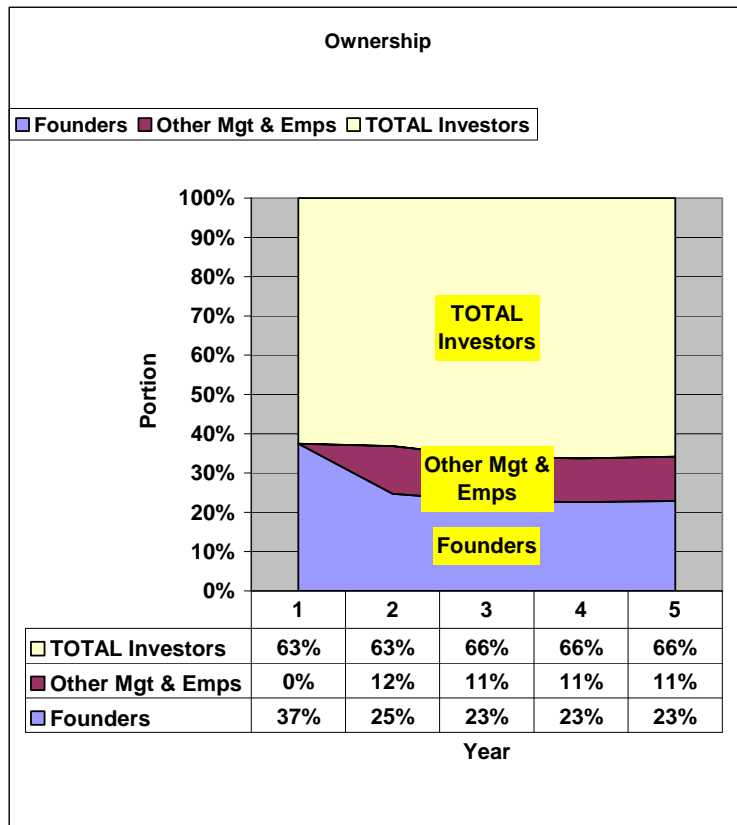


Figure 39: Accel to 3-D Ownership

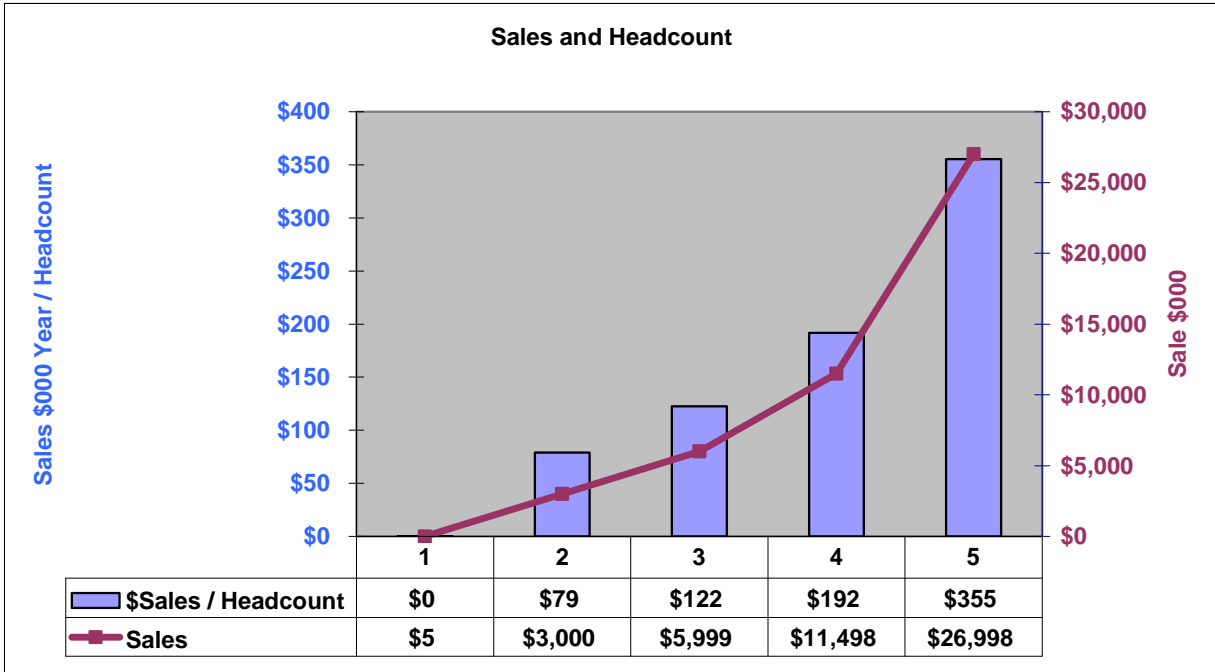


Figure 40: Accel to 3-D Sales and Headcount

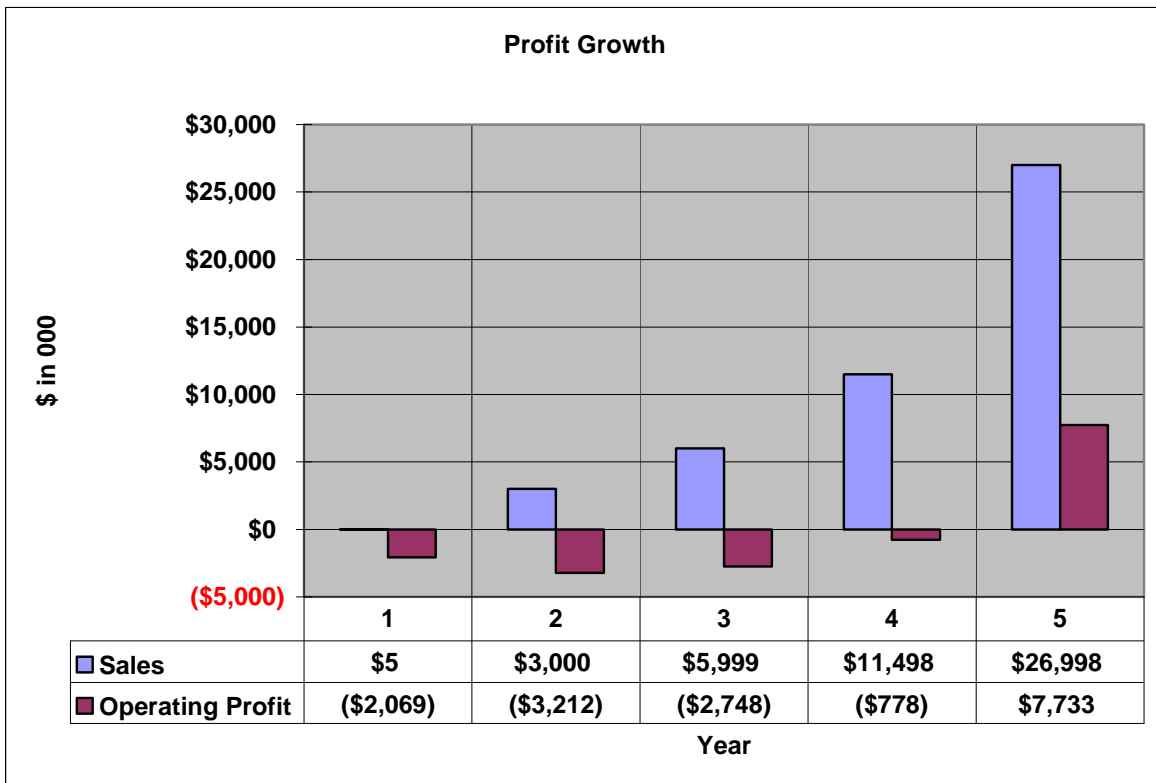


Figure 41: Accel to 3-D Profit Growth

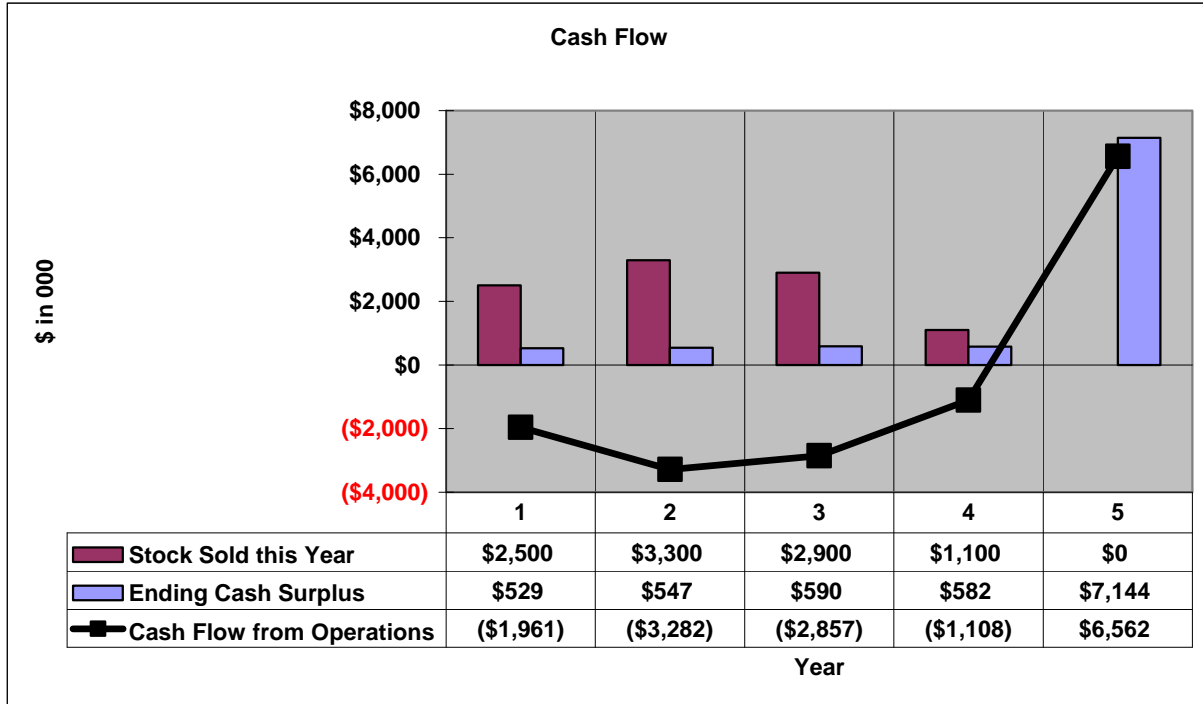


Figure 42: Accel to 3-D Cash Flow

8.7. Conclusions

It is clear that Accel’s current plans will have a high cost per unit. This is the result of a very expensive wireless node system from MicroStrain Inc. These costs can potentially be overcome by targeting their products and services to customers whose priority is high performance. Additionally this analysis recommends that the company adopt a consulting style, providing a very high degree of customer service. This is reflected in the model; this company has the highest year 5 headcount of those analyzed. While this approach will add significant labor costs, it should also greatly increase profit margins.

The company must also refine its research goals further before approaching venture capitalists. The Accel to 3-D proposal reviewed is clear on their intent to use a particular technology, but vague regarding its application. The medical field is likely to have great potential use for this technology in addition to the sports industry. Medical applications should be researched alongside what is already being suggested.

9. WiFiveO Business Plan Financial Source Data

9.1. Assumptions

5.1 General Assumptions

The following assumptions were used to formulate Wi-Five-O's financial statements.

Unit Price per ProMote	\$75
Cost Breakdown:	
Labor	\$10
Raw Materials (Sales below 10000 units)	\$25
Raw Materials (Sales above 10000 units)	\$15
Unit Price per SafetyNet	\$50
Cost Breakdown:	
Labor	\$5
Raw Materials (Sales below 10000 units)	\$10
Raw Materials (Sales above 10000 units)	\$5
Unit Price per Homeland Security Product	\$100
Cost of production	\$25
Unit Price per Wi-Five-O Projected Product	\$60
Cost of production	\$15
License Size for SafetyNet	1000 Units
Avg. Receivables Collection	30 days
Bad Debt Expense	2% of Sales
Corporate Tax Rate	35%
Inflation Rate	2%
Depreciation	Straight-Line over 7 years

Patents applications are filed every two years. Patent expenses vary based on the complexity of the patent to account for the legal expertise necessary to differentiate the patent. Patent maintenance fees are \$350 per year.

QuickUp Analysis of Wireless Sensor Network Startup Companies

Yearly Sales and Expense Assumptions

	2005	2006	2007	2008	2009
ProMote Sales	1000 Units	5000 Units	10000 Units	12500 Units	15625 Units
SafetyNet Licenses	0	1	5	10	12
Homeland Sec. Sales	0	0	1000 Units	2000 Units	5000 Units
Projected Prod. Sales	0	0	0	1000 Units	2000 Units
Equipment	\$30,000	0	0	0	0
Rent Expense	0	\$12,000	\$12,000	\$12,000	\$12,735
Mgt. Expense	\$50,000	\$100,000	\$250,000	\$250,000	\$250,000
Wage Salary Expense	\$100,000	\$153,000	\$260,100	\$530,604	\$649,459
Wage Benefit Expense	\$30,000	\$45,900	\$78,030	\$159,181	\$194,838
Utilities	\$5,760	\$5,875	\$5,993	\$6,113	\$6,235
R&D	\$20,000	\$20,000	\$40,000	\$40,000	\$50,000
Supplies	\$3,000	\$3,060	\$3,121	\$3,183	\$3,247
IT Expense	\$3,000	\$6,120	\$6,242	\$6,367	\$6,495
Legal Expense	\$8,000	\$16,120	\$6,242	\$6,367	\$6,495
Patent Expense	\$6,750	\$5,824	\$12,452	\$4,452	\$12,536

Headcount

	2005	2006	2007	2008	2009
Non-Management Employees	2	3	5	10	15

All non-management employees have an annual salary of \$50,000. Salaries are increased yearly at the rate of inflation. Employee benefits are 20% of salary for the first two years of operations and increase to 25% per year afterwards.

5.2 Revenue Projections

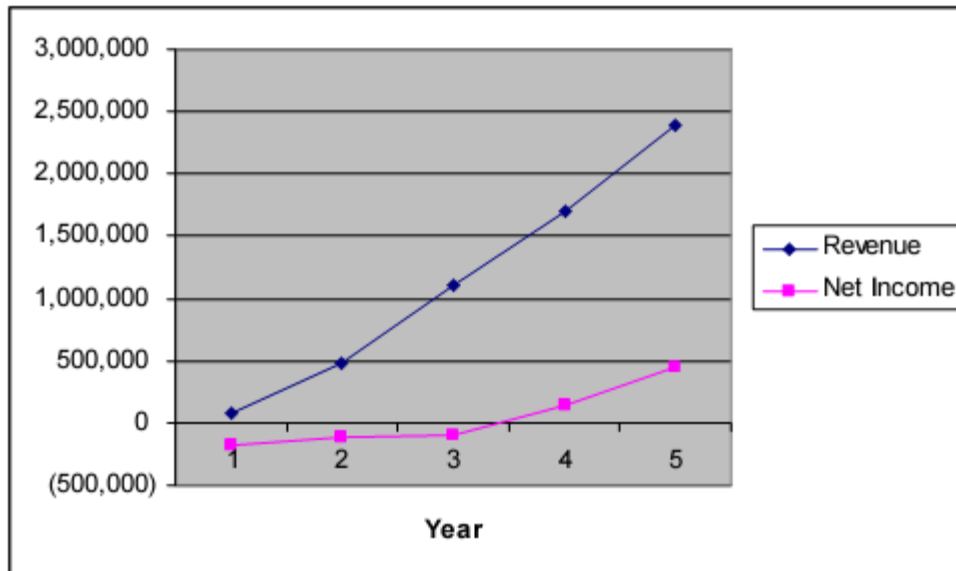
The table below shows projected revenue, expenses, and net income for the first five years of operations. Wi-Five-O turns its first profit in the fourth year of operations.

	2005	2006	2007	2008	2009
Revenue	85,000	480,000	1,100,000	1,697,500	2,391,875
Expense	263,652	587,385	1,194,691	1,554,758	1,929,916
Net Income	(\$179,078)	(\$109,785)	(\$100,191)	\$134,254	\$453,346

The graph below shows revenue versus net income for the first five years of operations.

QuickUp Analysis of Wireless Sensor Network Startup Companies

The graph below shows revenue versus net income for the first five years of operations.



9.2. Venture Capital Requirements

5.4 Cash Requirements/ Sources of Financing and Exit Strategy

Financial projections indicate that Wi-Five-O requires a total of \$750,000 in funding supplied in two installments. The first installment of \$500,000 is at the beginning of operations in the third quarter of 2005. The second \$250,000 installment occurs in the first quarter of 2007. Wi-Five-O partners with venture capitalists to secure this funding. Funding is in exchange for preferred stock, convertible to capital stock at the time of an IPO. Wi-Five-O will announce an IPO after the fifth year, the company's second profitable year. Additional funds raised in the IPO are used to create products for additional markets in the defense and medical industries, providing continued growth.

9.3. Income Statements

Income Statement for Wi-Five-O

	2005				Total
	Q1	Q2	Q3	Q4	
Sales & License Revenue			34,000	51,000	85,000
Less: Returns			170	256	426
Less: Discounts			0	0	0
Net Revenue			33,830	50,744	84,574
Cost of Goods Sold			12,000	18,000	30,000
Operating Expenses					
Management Salaries			20,000	30,000	50,000
Management Benefits			4,000	6,000	10,000
Wage Expense			40,000	60,000	100,000
Employee Benefits			8,000	11,999	19,999
Advertising and Travel			1,600	2,400	4,000
Office Expenses			1,200	1,800	3,000
Utilities			2,304	3,456	5,760
Rent Expense			0	0	0
Legal Expense			3,000	4,500	7,500
IT Expense			1,200	1,800	3,000
Patent Expense			2,700	4,050	6,750
Bad Debt Expense			600	900	1,500
Depreciation Expense			857	1,286	2,143
Research and Development			8,000	12,000	20,000
Net Operating Income (Loss)			(71,631)	(107,447)	(179,078)
Income Taxes @ 35%			0	0	0
Net Income (Loss)			(\$71,631)	(\$107,447)	(\$179,078)

QuickUp Analysis of Wireless Sensor Network Startup Companies

Income Statement Continued

	2006				
	Q1	Q2	Q3	Q4	Total
Sales & License Revenue	96,000	144,000	72,000	168,000	480,000
Less: Returns	480	720	360	840	2,400
Less: Discounts	0	0	0	0	0
Net Revenue	95,520	143,280	71,640	167,160	477,600
Cost of Goods Sold	38,000	57,000	28,500	66,500	190,000
Operating Expenses					
Management Salaries	20,000	30,000	15,000	35,000	100,000
Management Benefits	4,000	6,000	3,000	7,000	20,000
Wage Expense	30,600	45,900	22,950	53,550	153,000
Employee Benefits	6,120	9,180	4,590	10,710	30,600
Advertising and Travel	2,400	3,600	1,800	4,200	12,000
Office Expenses	612	918	459	1,071	3,060
Utilities	1,175	1,763	881	2,056	5,875
Rent Expense	2,400	3,600	1,800	4,200	12,000
Legal Expense	3,224	4,836	2,418	5,642	16,120
IT Expense	1,224	1,836	918	2,142	6,120
Patent Expense	1,165	1,747	874	2,038	5,824
Bad Debt Expense	1,700	2,550	1,275	2,975	8,500
Depreciation Expense	857	1,286	643	1,500	4,286
Research and Development	4,000	6,000	3,000	7,000	20,000
Net Operating Income (Loss)	(21,957)	(32,935)	(16,468)	(38,425)	(109,785)
Income Taxes @ 35%	0	0	0	0	0
Net Income (Loss)	(\$21,957)	(\$32,935)	(\$16,468)	(\$38,425)	(\$109,785)

QuickUp Analysis of Wireless Sensor Network Startup Companies

Income Statement Continued

	2007					2008	2009
	Q1	Q2	Q3	Q4	Total		
Sales & License Revenue	330,000	220,000	385,000	165,000	1,100,000	1,697,500	2,391,875
Less: Returns	1,650	1,100	1,925	825	5,500	8,488	11,595
Less: Discounts	0	0	0	0	0	0	0
Net Revenue	328,350	218,900	383,075	164,175	1,094,500	1,689,012	2,380,280
Cost of Goods Sold	135,000	90,000	157,500	67,500	450,000	477,500	665,625
Operating Expenses							
Management Salaries	75,000	50,000	87,500	37,500	250,000	250,000	250,000
Management Benefits	15,000	10,000	17,500	7,500	50,000	50,000	50,000
Wage Expense	78,030	52,020	91,035	39,015	260,100	530,604	649,459
Employee Benefits	19,508	13,005	22,759	9,754	65,025	132,651	162,365
Advertising and Travel	2,700	1,800	3,150	1,350	9,000	2,000	12,000
Office Expenses	936	624	1,092	468	3,121	3,183	3,247
Utilities	1,867	1,245	2,178	933	6,223	6,598	6,235
Rent Expense	3,600	2,400	4,200	1,800	12,000	12,000	12,735
Legal Expense	1,873	1,248	2,185	936	6,242	6,367	6,495
IT Expense	1,873	1,248	2,185	936	6,242	6,367	6,495
Patent Expense	3,736	2,490	4,358	1,868	12,452	4,452	12,536
Bad Debt Expense	6,000	4,000	7,000	3,000	20,000	28,750	35,438
Depreciation Expense	1,286	857	1,500	643	4,286	4,286	4,286
Research and Development	12,000	8,000	14,000	6,000	40,000	40,000	50,000
Net Operating Income (Loss)	(30,057)	(20,038)	(35,067)	(15,029)	(100,191)	134,254	453,364
Income Taxes @ 35%	0	0	0	0	0	0	0
Net Income (Loss)	(\$30,057)	(\$20,038)	(\$35,067)	(\$15,029)	(\$100,191)	\$134,254	\$453,364

9.4. Balance Sheets

Balance Sheet for Wi-Five-O

	2005				Total
	Q1	Q2	Q3	Q4	
Current Assets:					
Cash			129,646	162,057	324,114
Accounts Receivable			5,689	7,111	14,222
Inventories			8,576	10,720	21,440
Total Current Assets			143,911	179,888	359,777
Fixed Assets:					
Buildings & Equipment			12,000	15,000	30,000
Non-depreciable assets			0	0	0
Less Accum Deprec.			(857)	(1,071)	(2,143)
Total Fixed Assets			11,143	13,929	27,857
Total Assets			\$155,054	\$193,817	\$387,634
Current Liabilities:					
Accounts Payable			6,109	7,636	15,272
Short Term Loans			0	0	0
Other short term liabilities			20,576	25,720	51,440
Total Current Liabilities			26,685	33,356	66,712
Long-term Liabilities			0	0	0
Total Liabilities			\$26,685	\$33,356	\$66,712
Stockholder's Equity:					
Contributed Capital			200,000	250,000	500,000
Retained Earnings			(71,631)	(89,539)	(179,078)
Total Stockholder's Equity			\$128,369	\$160,461	\$320,922
Liabilities + Equity			\$155,054	\$193,817	\$387,634

QuickUp Analysis of Wireless Sensor Network Startup Companies

Balance Sheet Continued

	2006				Total
	Q1	Q2	Q3	Q4	
Current Assets:					
Cash	41,089	61,634	30,817	71,906	205,445
Accounts Receivable	7,890	11,836	5,918	13,808	39,452
Inventories	11,356	17,033	8,517	19,872	56,778
Total Current Assets	60,335	90,503	45,251	105,586	301,676
Fixed Assets:					
Buildings & Equipment	6,000	9,000	4,500	10,500	30,000
Non-depreciable assets	0	0	0	0	0
Less Accum Deprec.	(1,286)	(1,929)	(964)	(2,250)	(6,429)
Total Fixed Assets	4,714	7,071	3,536	8,250	23,571
Total Assets	\$65,049	\$97,574	\$48,787	\$113,836	\$325,247
Current Liabilities:					
Accounts Payable	5,466	8,199	4,099	9,565	27,328
Short Term Loans	0	0	0	0	0
Other short term liabilities	17,356	26,033	13,017	30,372	86,778
Total Current Liabilities	22,821	34,232	17,116	39,937	114,107
Long-term Liabilities	0	0	0	0	0
Total Liabilities	\$22,821	\$34,232	\$17,116	\$39,937	\$114,107
Stockholder's Equity:					
Contributed Capital	100,000	150,000	75,000	175,000	500,000
Retained Earnings	(57,772)	(86,658)	(43,329)	(101,101)	(288,860)
Total Stockholder's Equity	\$42,228	\$63,342	\$31,671	\$73,899	\$211,140
Liabilities + Equity	\$65,049	\$97,574	\$48,787	\$113,836	\$325,247

QuickUp Analysis of Wireless Sensor Network Startup Companies

Balance Sheet Continued

	2007					2008	2009
	Q1	Q2	Q3	Q4	Total		
Current Assets:							
Cash	101,283	67,522	118,164	50,642	337,611	434,648	856,301
Accounts Receivable	27,123	18,082	31,644	13,562	90,411	139,521	196,592
Inventories	35,290	23,527	41,172	17,645	117,633	167,111	218,084
Total Current Assets	163,697	109,131	190,979	81,848	545,655	741,279	1,270,977
Fixed Assets:							
Buildings & Equipment	9,000	6,000	10,500	4,500	30,000	30,000	30,000
Non-depreciable assets	0	0	0	0	0	0	0
Less Accum Deprec.	(3,214)	(2,143)	(3,750)	(1,607)	(10,714)	(15,000)	(19,286)
Total Fixed Assets	5,786	3,857	6,750	2,893	19,286	15,000	10,714
Total Assets	\$169,482	\$112,988	\$197,729	\$84,741	\$564,941	\$756,279	\$1,281,692
Current Liabilities:							
Accounts Payable	16,911	11,274	19,729	8,455	56,368	63,974	85,049
Short Term Loans	0	0	0	0	0	0	0
Other short term liabilities	44,290	29,527	51,672	22,145	147,633	197,111	248,084
Total Current Liabilities	61,200	40,800	71,400	30,600	204,001	261,085	333,133
Long-term Liabilities	0	0	0	0	0	0	0
Total Liabilities	\$61,200	\$40,800	\$71,400	\$30,600	\$204,001	\$261,085	\$333,133
Stockholder's Equity:							
Contributed Capital	225,000	150,000	262,500	112,500	750,000	750,000	750,000
Retained Earnings	(116,718)	(77,812)	(136,171)	(58,359)	(389,060)	(254,806)	198,558
Total Stockholder's Equity	\$108,282	\$72,188	\$126,329	\$54,141	\$360,940	\$495,194	\$948,558
Liabilities + Equity	\$169,482	\$112,988	\$197,729	\$84,741	\$564,941	\$756,279	\$1,281,692

9.5. Cash Flows

Statement of Cash Flows for Wi-Five-O

	2005				Total
	Q1	Q2	Q3	Q4	
Source of Funds					
Beginning cash			0	0	0
Sales/License Income			28,311	42,467	70,778
Loans			0	0	0
Contributed Capital			200,000	300,000	500,000
Available Cash			\$228,311	\$342,467	\$570,778
Use of Funds					
Salaries			60,000	90,000	150,000
Other oper. expenses			38,665	57,998	96,663
Loan payments			0	0	0
Dividends			0	0	0
Tax Payments			0	0	0
Total Cash Out			(\$98,665)	(\$147,998)	(\$246,663)
Net Cash Flow			\$129,646	\$194,469	\$324,114

QuickUp Analysis of Wireless Sensor Network Startup Companies

Source of Funds	2006				Total
	Q1	Q2	Q3	Q4	
Beginning cash	64,823	97,234	48,617	113,440	324,114
Sales/License Income	90,954	136,431	68,216	159,170	454,770
Loans	0	0	0	0	0
Contributed Capital	0	0	0	0	0
Available Cash	\$155,777	\$233,665	\$116,833	\$272,610	\$778,885
Use of Funds					
Salaries	50,600	75,900	37,950	88,550	253,000
Other oper. expenses	64,088	96,132	48,066	112,154	320,439
Loan payments	0	0	0	0	0
Dividends	0	0	0	0	0
Tax Payments	0	0	0	0	0
Total Cash Out	(\$114,688)	(\$172,032)	(\$86,016)	(\$200,704)	(\$573,439)
Net Cash Flow	\$41,089	\$61,634	\$30,817	\$71,906	\$205,445

Statement of Cash Flows Continued

Source of Funds	2007				Total	2008	2009
	Q1	Q2	Q3	Q4			
Beginning cash	61,634	41,089	71,906	30,817	205,445	337,611	434,648
Sales/License Income	314,712	209,808	367,164	157,356	1,049,041	1,648,390	2,334,803
Loans	0	0	0	0	0	0	0
Contributed Capital	75,000	50,000	87,500	37,500	250,000	0	0
Available Cash	\$451,346	\$300,897	\$526,570	\$225,673	\$1,504,486	\$1,986,002	\$2,769,451
Use of Funds							
Salaries	153,030	102,020	178,535	76,515	510,100	780,604	899,459
Other oper. expenses	197,033	131,355	229,871	98,516	656,775	770,750	1,013,691
Loan payments	0	0	0	0	0	0	0
Dividends	0	0	0	0	0	0	0
Tax Payments	0	0	0	0	0	0	0
Total Cash Out	(\$350,063)	(\$233,375)	(\$408,406)	(\$175,031)	(\$1,166,875)	(\$1,551,354)	(\$1,913,150)
Net Cash Flow	\$101,283	\$67,522	\$118,164	\$50,642	\$337,611	\$434,648	\$856,301

10. Mechanics and Use of QuickUp Software

10.1. First Model

In the first stage of modeling a startup company, QuickUp presents the user with a basic Income Statement and Balance Sheet. The numbers filled in here for total sales, expenses, etc. are for the most part arbitrary and are simply used as “filler” numbers until they are later replaced with more accurate figures from subsequent sheets. This first section explains how the data in the Income Statement and Balance Sheet are related, and this applies throughout the modeling process.

The gross margin is the first measure of how much money a company is bringing in:

$$M_g = S_{tot} - C_{ph}$$

Where S_{tot} is the total sales of the organization, and C_{ph} is the *physical* cost of producing the goods sold, such as materials, shipping, etc. This is often expressed as a percentage of the total sales:

$$M_g (\%) = \frac{M_g}{S_{tot}} \cdot 100$$

Of course, not all costs of producing a good or service are physical, in fact in many cases the physical cost is negligible in comparison to the **Operating Expenses** of a company. These can include many costs of operating a company and in this phase of the model include *Research and Development/Engineering, Sales/Marketing/Customer Support, and Finance/General Administrative*. The total Operating Expenses are subtracted from Gross Margin to obtain the **Operating Profit**:

$$P_{op} = M_g - E_{op}$$

This also can be expressed as a percentage of total sales:

$$P_{op} (\%) = \frac{P_{op}}{S_{tot}} \cdot 100$$

Taxes must then be paid on both the Operating Profit and any **Cumulative Retained Earnings** from the previous year, thus the company must make a *provision* (setting money aside) to pay income taxes. Taxes are owed only if the sum of Operating Profit and Cumulative Retained Earnings is greater than zero.

$$T_{prov} = (E_{CR} + P_{op}) \cdot T_R$$

QuickUp Analysis of Wireless Sensor Network Startup Companies

Where T_R is the Tax Rate the government charges. Finally, we obtain from this Income Statement the **Net Income** after all taxes are considered, as both a dollar amount and a percentage of total sales:

$$I_{net} = P_{op} - T_{prov} \quad I_{net} (\%) = \frac{I_{net}}{S_{tot}}$$

The *Balance Sheet* shows both the company's *assets* (what it has) and its *liabilities* (what it owes to others). The Balance Sheet is linked to the Income Statement through a process called *feeding*. The assets of the company include **Checking Account balances, Surplus Cash, Receivables** (money owed by customers), and product **Inventory**. They sum to form the **Current Assets**:

$$A_{curr} = CH + C_{surp} + RE + INV$$

Most companies also own **Equipment**, which is an asset. However, this equipment generally loses value over time and thus is said to have **Cumulative Depreciation**, thus the **Net Equipment** is the difference:

$$EQ_{net} = EQ - DEP$$

We now have the **Total Assets** of the company:

$$A_{tot} = A_{curr} + EQ_{net}$$

The second part of the Balance Sheet totals the company's liabilities and equity (stock and retained earnings.) The **Current Liabilities** include the **Accounts Payable** and **Taxes Payable**:

$$L_{curr} = AP + TP$$

The **Total Shareholder's Equity** is calculated from the Cumulative Retained Earnings and **Cumulative Stock Sold**:

$$TSE = CRE + CSS$$

The **Total Liabilities and Equity** and then simply the sum of Current Liabilities and Total Shareholder's Equity:

$$TLE = L_{curr} + TSE$$

The preceding equations are for the most part general, and would be learned in an entry level accounting class without the need for any modeling. The QuickUp software does more than simply find account balances and show profits however. The remainder of this report focuses on how QuickUp *modifies* the Income Statement and Balance Sheet as it is provided with more and more information from the user. The results of the model are still governed by these general accounting concepts.

10.2. Forecast People

QuickUp asks the user to input the following information about your startup:

1. The number of workers in each department for each year. QuickUp considers the following departments: Manufacturing/Operations/Website, R&D/Engineering, Sales/Marketing/Customer Support, and Finance General/Administrative.
2. The expenses in each department per person (on average) each year. When figuring these expenses, the user must consider all costs such as wages, health insurance, travel, depreciation, share of rent, supplies, outside services, etc.

QuickUp then calculates the following set of new expenses based on these numbers. When the calculations are complete, the user should adjust the Cumulative Stock Sold to show a Surplus Cash of at least \$500,000.

For calculating this section, QuickUp first adds the headcount in each department to obtain the **Total Headcount** (TH) for the company for each year (equation not shown.) QuickUp shows the **Total Sales Dollars Per Person** (TSPP) in the company:

$$TSPP = \frac{S_{tot}}{TH}$$

QuickUp is then able to multiply the number of people in each department by the expenses per person to obtain realistic expense numbers for each department. This new information is inserted into the income statement as described in Section A6: First Model. This data will replace the arbitrary numbers that were previously used in the income statement as placeholders.

When adjusting the Cumulative Stock Sold to obtain positive surplus cash numbers, QuickUp uses the following method:

$$C_{SURP} = TLE - TALSC$$

Here the surplus cash is the difference of Total Liabilities and Equity and **Total Assets Less Surplus Cash**.

10.3. Sales and Cost of Goods Sold

Now the model must be provided more details about the products or services being rendered. This allows more detailed modeling of the production costs and actual sales dollars. The user enters the following information:

1. The average sale price of each unit sold
2. The total number of units expected to sell
3. The cost to produce one unit
4. The total expenses per headcount of Manufacturing/Operations personnel. Note that this forecast of people expenses is modeled here and not the previous sheet. (MOE)
5. Any other miscellaneous expenses from Manufacturing/Operations (OE)

Using this information, QuickUp is able to re-evaluate both the total sales dollars and the total cost of goods/services sold. The new value for Total Sales is simply the sale price per unit multiplied by the number sold (equation not shown.) The new **Cost of Goods Sold** is the sum of **Manufacturing/Operations Personnel, Production Costs, and Other Expenses:**

$$CGS = MOE + PC + OE$$

With this data in hand, QuickUp is able to recalculate the Operating Profit, and Net Income, since all data for the Income Statement has been gathered.

10.4. Balance Sheet Details

Now details must be added to the balance sheet. The user inputs the following items:

1. The average cost of office type equipment per each new person added to the company
2. The cost of any new special equipment that must be purchased
3. Receivables: the number of days a customer has to pay the company (REDAYS)
4. Inventory: the number of days that the cost of goods sold will apply (INV DAYS)
5. Accounts Payable: the average number of days to pay suppliers (APDAYS)
6. An updated tax rate paid on profits in excess of cumulative losses
7. Percent of total equipment that is leased, and the number of years for which the lease is valid
8. Percent Receivables Borrowed: the portion of Accounts Receivable used as collateral for Bank Debt borrowings (PRB)
9. For interest expenses, the Lease Interest Rate and the Bank Interest Rate per annum

QuickUp first takes the **Office Equipment Per Person** estimate provided by the user and multiplies by the **Number of New Employees** that year to obtain the dollar value of all **New Office Equipment** for that year (equation not shown.) **Special Equipment** for that year is then added to obtain the **Total New Equipment** for the current year. Equipment costs for all previous years are added to obtain the **Cumulative Equipment** up to that point. This data is input to the "Equipment" line of the Balance Sheet (equations not shown.)

QuickUp also factors depreciation into its model. In its model, all equipment is "straight-line" depreciated over a period of three years, at which point its value is considered zero. **Depreciation Expense** for the current year is calculated as follows:

$$DE = \frac{CMEQ}{3}$$

Where CMEQ is the **Cumulative Equipment** purchased *within the last three years*. The total **Cumulative Depreciation** is figured from the Depreciation Expense from the current year and the Cumulative Depreciation from the prior year (hence it is recursive!)

$$CMDEP = CMDEP + DE$$

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This number is inserted directly into the line “Cumulative Depreciation” on the Balance Sheet.

QuickUp can now also finish filling in the Assets portion of the Balance Sheet. The line for **Receivables**:

$$RE = \frac{S_{tot}}{365} \cdot REDAYS$$

Where again REDAYS is the number of days is the user-entered number of days to pay the company.

The line for **Inventory**:

$$INV = \frac{CGS}{365} \cdot INVDAYS$$

Where again INVDAYS is the number of days the Cost of Goods Sold will apply. QuickUp now has all the information to calculate Total Assets. The model moves on to Liabilities and Equity.

The line for **Bank Debt**:

$$BNKDBT = RE \cdot PRB$$

Where again PRB is the percentage of **Receivables** used to borrow from banks.

When calculating leases, QuickUp divides the **Total Leases** into **Current Portion** and **Long Term Portion**. The Current Portion is simply the Total Leases for that year divided by the life of the lease. The Long Term Portion is the remaining amount (equations not shown.) This data is recorded in the Assets and Liabilities section of the Balance Sheet.

Accounts Payable is calculated as follows:

$$AP = \frac{CGS + OE}{365} \cdot APDAYS$$

Where again APDAYS is the number of days the company has to pay suppliers. The details of the Income Statement and Balance Sheet are now complete. As before, QuickUp recommends adjusting Cumulative Stock Sold until there is a Surplus Cash of at least \$500,000. The model is now ready to calculate the company’s valuation.

10.5. Valuation / Return on Investment

The final step in the basic model is to determine the company’s valuation. Typically a startup company will go public in year five, and this is the first year where the user will set the company’s total value, working backwards. This sheet has the following inputs:

1. Total Company Value in Millions (TCV). The spreadsheet gives three methods of finding this number. See below.
2. Number of shares granted to each of the following groups in year 1: Founders (SGF), Vice Presidents and other executives (SGVP), Directors (SGD), Managers (SGM), and employees (SGE).
3. Number of shares granted to each of the following groups in each of years 1 through 5: Contractors (SGC), Support Services (SGSS), and Other (SGO).

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QuickUp gives three methods of finding the company's total valuation. The first is simply to guess at it (by just entering a value). The others may yield better results. TCV may be expressed using a **Multiple of Revenue** or **Multiple of Net Income**, calculated as follows:

$$TCV = MOR \cdot S_{tot}$$
$$TCV = MNI \cdot I_{net}$$

Where here the user needs only to set the MOR or MNI, whichever he chooses to use. These numbers can be matched to typical values for the type of company being modeled, the default value for MOR is 4.0, and the default for MNI is 33.

QuickUp then introduces the concept of "Pre-Money" and "Post-Money." Post-Money refers to the Total Company Value (TCV) just set by the user. Pre-Money is the total company value *minus* the New Stock Sold for that year (equation not shown). QuickUp provides these values for comparison purposes.

The user must now decide how many shares will be granted to members of his company in the Company Ownership section of the sheet. Large quantities of ownership data will be calculated from "what's left" after the employees of the company claim their shares. The **Total Stock Granted to Non-Investors** is just the sum total:

$$TSGNI = SGF + SGVP + SGD + SGM + SGE + SGC + SGSS + SGO$$

Once this information has been determined, the stock distributed to investors is calculated based on the **New Stock Sold** (NSS) for that year. Four types of investors are considered here, Series A, B, C, and D (denoted TSA, TSB, TSC, and TSD). The letter designation simply determines *in what year* they will receive the stock (1, 2, 3, and 4, respectively.) For example, if it is currently year three:

$$TSC = NSS$$

Therefore, the **Total Shares Granted to Investors** is cumulative:

$$TSGI = TSA + TSB + TSC + TSD$$

Now QuickUp has the **Total Company Shares**, a very important number for calculating percentage ownership:

$$TCS = TSGNI + TSGI$$

QuickUp gives a detailed section showing the percentage of company ownership for each category of investors and non-investors. For any given category, the **Percentage of Company Ownership** is the number of shares owned by that category divided by the **Total Company Shares**:

$$\%CO = \frac{TSA}{TCS}$$

Where Series A Investors are used for this example.

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Using the **Total Company Value** and the **Total Company Shares**, the **Share Price** is calculated, which is really just a ratio:

$$SP = \frac{TCV}{TCS}$$

QuickUp also features wealth calculations for each category of investors and employees. Each of these is the number of shares owned by that category multiplied by the share price (equation not shown). If you are a company executive, you now have an idea of how much money you will be worth when the company goes public!

Return on Investment (ROI) is the final goal of this sheet. It is shown as both a multiple and as a percentage. Potential investors in the startup will look very closely at these values when making decisions. The **ROI** is calculated by dividing the **Share Price** in year 5 by the “**Share Price**” for the current year (SPC):

$$ROI = \frac{SP5}{SPC}$$

Note that the Share Price for the current year is in quotations because the current year is prior to the IPO. So the “Share Price” is just the current company value per share. ROI shows how many times one dollar invested in a given year has grown when year 5 is reached.

If the user prefers to see this multiple as a percentage, Excel has a built in function called RATE to determine what *Annual Percentage Yield* would be needed to grow current year dollars into year 5 dollars:

$$ROI\% = RATE(\#YEARS, ROI)$$

10.6. Introduction to Detailed Model

QuickUp allows the user to take their model to another level entirely with 17 additional sheets, which simply add detail to the basic principles already described. Each section briefly describes what is added or changed for each sheet in the model. Less detail is needed here since the mechanics of the QuickUp model have already been described, and there is a large amount of new data being calculated in the detailed model.

10.7. Market Size

It is very useful to compare *your* company’s sales dollars to the total *market size* that exists in your industry. The market size is the total number of dollars being spent by companies and consumers on a particular good or service. For this sheet, QuickUp requires the user to know the total size of his market. QuickUp compares the company’s **Total Sales** to both the **Total Available Market** and the **Total Served Market**. The Total Served Market represents the market’s current size, while the Available Market represents its potential size. This is also the first sheet to allow the user to enter the month-by-month details of the first year. This pattern continues for the rest of the model, since generally the company does not start producing goods immediately.

10.8. Sales Model

This sheet is quite simple. It allows tabulation of total sales just like the previous First Model, but with one key difference. Here the user may enter **Sales Units** and **Average Sale Price per Unit Sold** on a *per model* basis. Per model here means the type of unit being sold (i.e., the company makes cars called A, B, and C.)

10.9. Cost of Goods Sold

Here the method of calculating the cost of producing goods is refined to be more realistic. As before in Section A13: Sales Model, Year 1 is broken down into months, and sales are expressed separately for each model (type of car, etc.) This advanced cost calculator allows the user to input what QuickUp calls a **Learning Curve**. It makes sense that as a company continues to produce a product, it becomes more efficient, thus lowering costs. For each month, (and each year thereafter) a Learning Curve number is entered, which is a percentage reduction in the cost to produce one unit. A convenient plot then shows the Learning Curve for each year alongside the Cost of Producing 1 Unit for each year.

10.10. People & Expenses & Facility

This section details the company's costs for its headcount of workers and the facility it uses to operate, as in the sheet Forecast People of the first model. The enhanced control given here is in the separation of **Company Founders** from their respective departments. Expenses are still estimated by the user on a per department basis. The operating expenses are shown in rows both with and without depreciation.

The sheet also adds the ability to calculate the needed floor space for leasing. The user estimates **Square Feet Per Person**, **Percentage of People Space Needed for Other Large Space**, and **Lease Cost per Square Foot**. QuickUp breaks these expenses down by department.

QuickUp also adds the ability to use recruiting to bring in new hires, and display this expense. Inputs are the **Percentage of Department Recruited** and **Percentage of 1 Year's Salary** commission paid to the recruiter.

10.11. Taxes

The detailed model provides a separate sheet for income tax provisions. The user needs only enter the **Tax Rate** for each year. As before, the Provision for Income Taxes applies when the sum of Beginning Retained Earnings and Net Income is positive. The displayed data here comes from the next sheet, the Income Statement.

10.12. Receivables

This section provides detailed analysis of receivables for the company. The user enters the **Average # of Days to Collect (AV#DC)**, and the **Number of Days per Month**. QuickUp uses the following formula to calculate the **Ending Balance Accounts Receivable** for a given month:

$$AR = AVSD \cdot AV\#DC$$

Where AVSD is the **Average Sales per Day** calculated from the previous 2 months.

For the following years, the user can input the percentage of Total Sales that will apply to each quarter. Using the percentage from the 4th quarter, QuickUp will calculate an Ending Balance Accounts Receivable for that year.

10.13. Inventory

Here the user enters the **Number of Days Inventory on Hand**, and as before the **Portion of Sales** for each quarter. In a similar manner to Accounts Receivable, QuickUp calculates the **Average Cost of Goods & Services / Day** and uses this number to get the **Ending Inventory Balance**. This advanced model also allows the user to designate the portion of the inventory that is purchased, thereby adjusting the amount of Ending Inventory that is purchased outside the company.

10.14. Payables

This sheet is again very similar to the previous sheets, where the user enters the **Average # of Days to Pay** for Accounts Payable. QuickUp calculates the **Average Purchases per Day** and finds the **Ending Balance Accounts Payable**.

10.15. Equipment

For calculating the total costs for equipment for the company, QuickUp allows entering the costs per person of each new hire in every department. When all departments are totaled, this is the **New Total Equipment**. QuickUp also keeps track of the Cumulative Total Equipment.

10.16. Leasing & Debt & Interest

This section of the advanced model is very similar to the basic version. The user chooses **%Equipment Leased, Life of Leases, %Receivables Borrowed, Lease Interest Rate, and Bank Interest Rate**. With these numbers, combined with the Total Equipment and Total Receivables from earlier, the **Total Interest Expense** can be calculated for each year.

10.17. Accrued Expenses

This section gains information from the user that the basic model does not have. Accrued Expenses allow the budget to be increased for vacation pay and other expenses. QuickUp asks for a target **Payroll and % of Operating Expenses**, compares this with the Total Operating Expenses, and determines the **Payroll Per Year**. The **Vacation Accrued** is determined with this formula:

$$VA = PPY \cdot \frac{\#WV}{48}$$

Where **#WV** is the number of weeks vacation per person per year. Vacation Accrued is added in with the user-defined **Other Accrued Expenses** to determine **Total Accrued Expenses**.

10.18. Cash Flow State

This new type of sheet allows the user to see all cash flows into and out of the company at-a-glance. The sheet makes a distinction between two types of cash flows, the **Net Cash from Operations** and the **Net Cash from Financing**. The Net Cash from Operations is the SUM of the following:

- Net Income
- Cumulative Depreciation
- Receivables
- Inventory
- Other Current Assets
- Accounts Payable
- Accrued Expenses
- Taxes Payable
- Other Current Liabilities
- Equipment
- Rent Deposits

In addition, the Net Cash from Financing is the SUM of these items:

- Stock Sold this year
- Leases- Current Portion
- Leases- Long Term Portion
- Total Bank Debt
- Cash for Operations

The Net Cash from Operations is added to Net Cash from Financing to obtain the final **Net Cash Flow**. Together with **Opening Cash Surplus**, this is the **Ending Surplus Cash**. QuickUp offers a BALANCE CHECK with the Surplus Cash from the Balance Sheet to ensure that there is no difference.

10.19. Valuation and Stock Options

This section is also similar to the valuation section of the basic model. The first step is to choose a company value, also known as a “pre-money” value. This will become a “post-money” value once the value of the shares sold to venture capitalists are factored in. As before, the shares are sold in “rounds” labeled A, B, C etc. The A round will get the first opportunity to buy shares, (and hopefully the best ROI for them!) QuickUp tracks the number of shares, share price, and even the portion of company ownership for investors vs. non-investors. QuickUp allows customization of how shares are divided up among the non-investors.

10.20. Department Expenses

This section details the expenses already determined for each department, and allows the formation of a budget for how the remainder will be spent. For example:

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*DEPARTMENT EXPENSES (TOT) – PAYROLL – OUTSOURCING –
DEPRECIATION – LEASES = SURPLUS*

This surplus is the Other (forced) line of the sheet and can be allocated to other uses. It is important that it never be negative.

10.21. Conclusion

The Advanced Model is essentially a more detailed version of the Basic Model detailed in the first section. By adding more opportunity for customization, and the ability to see more data, it gives the clarity needed for serious investment. However, the basic model is still very accurate for the financial principles presented in Section 10.1: First Model.

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