



ImageWare Systems, Inc.

Foundational IP for the Biometric Security Space

Research Initiation | June 12, 2012

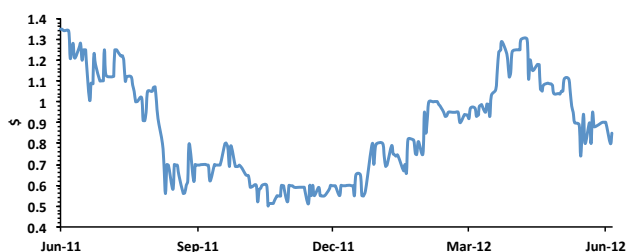
SEEING VALUE OTHERS DO NOT. CREATING VALUE OTHERS CAN NOT.

Company Details



Headquarters: San Diego, CA
Employees: Approximately 50
Fiscal Year End: December
Listing: IWSY (OTC)

Price Performance



	YTD	3m	6m	12m
Return	6.25%	-14.14%	41.67%	-29.75%

Last Price	\$0.85
Date of Price	6/11/12
52-week Range	\$0.41 - \$1.35
Shares Outstanding (mm)	68.61

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Please read the disclosures beginning on page 30 for important required information, including analyst certification.

Investment Summary

We are initiating coverage of ImageWare Systems, Inc. (“ImageWare,” or the “Company”). ImageWare is a company with vast experience in the field of multimodal biometrics that owns patented technologies that could disrupt the growing biometric security market.

Growing Market

The biometric security industry is growing at a rapid pace, due primarily to the increased need for domestic security and for more reliable identification and verification technologies. Acuity Market Intelligence projects the global biometrics market to reach nearly \$10.8 billion by 2017, representing a 20% CAGR.

Competitive Technology

Version 2.0 of ImageWare’s Biometric Engine (“BE 2.0”) is an agnostic, multi-modal biometrics software processing system. BE 2.0 is a significant technological upgrade, providing enhanced accuracy, speed, user friendliness, openness and cloud access over the prevailing biometrics software solutions in the marketplace.

Foundational Intellectual Property

ImageWare was the first company to file patents related to multimodal biometrics, so it owns foundational IP on multimodal biometric analysis, platform, and fusion. The Company plans to file 30-40 more patents in the next 10 months to further protect its IP leadership position.

High Margin Product Offering

Most of the Company’s anticipated revenues will come from licensing BE 2.0 to government and enterprise customers. ImageWare is working to ensure it can provide BE 2.0 “off the shelf,” which should provide gross margins in the range of 80%.

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Background

ImageWare's roots are in digital imaging, and it has focused on biometrics system management since 1999.

Most of ImageWare's customers are government agencies, but it hopes to be able to win customers in the enterprise space going forward.

History

ImageWare provides solutions for multimodal biometric security for use in a variety of government, enterprise, and consumer markets.

Founded in 1987, ImageWare pioneered the use of digital imaging in photo booths. In 1999, the Company switched its focus to creating systems that manage biometric data, which were mostly used by law enforcement. In 2005, ImageWare introduced its flagship product, the Biometric Engine. The Company released BE 2.0 in May 2012.

ImageWare had a successful initial public offering in 2000 and a private placement in December 2011. Most of the Company's approximately 50 employees work out of ImageWare's headquarters in San Diego, California.

Customers

Approximately 95% of ImageWare's current customers are government institutions and agencies including law enforcement, border security, and the military. The Company's largest customer is Arizona's Department of Public Safety, for which the Company has developed an online biometric booking system and provided investigative and identification solutions.

The Company is currently in the process of selling BE 2.0 implementations in similar environments. In addition, ImageWare hopes to diversify its customer base by increasing its involvement in enterprise and consumer markets.

In general, therefore, we expect the Company's customers to be governments in the near term, with long-term growth into the enterprise-level commercial markets. It can be difficult for large players such as governments and enterprises to entrust a project of the size, scope and sensitivity of biometrics solution implementation to a smaller player such as ImageWare. As a result, ImageWare often works on these implementations as a subcontractor to a larger prime contractor (often called a systems integrator). Major systems integrators in this space include Lockheed Martin, Unisys, and Fujitsu.

Product and Technology Overview

BE 2.0 is an agnostic software platform that can integrate with whichever hardware sensors or identification algorithms a customer may choose.

BE 2.0 supports multimodal fusion processing, which means it can support identify verification through a variety of different biometrics, including facial recognition, fingerprinting or iris scanning.

BE 2.0 also contains a proprietary database that has been optimized for biometric images, which can significantly reduce query search times.

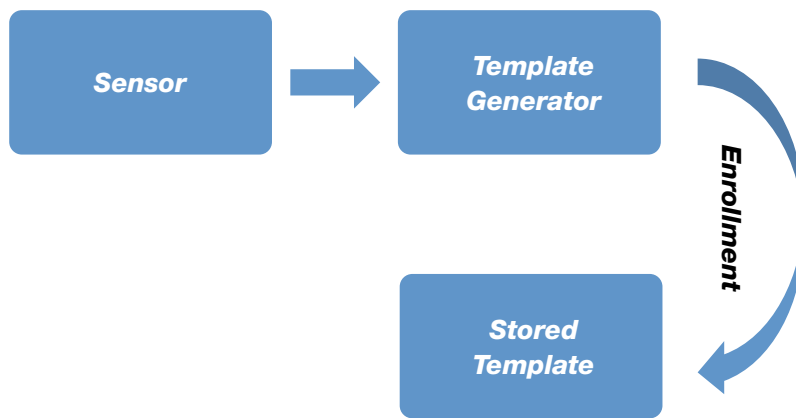
A biometric is a measurable (usually anatomical) human trait; the most commonly used biometrics are images of an individual’s fingerprints, irises, or face. BE 2.0 is an agnostic multimodal fusion-based

software platform connected to a database custom-designed to manage biometrics data. We describe these terms below.

Agnostic Software Platform

There are two basic processes that constitute a biometrics system. The first step is called *enrollment*, which takes place when an individual submits a biometric sample (e.g. image of an iris) to the system for the first time, to establish his or her identity. (See Figure 1.) First, a hardware sensor captures the biometric data. Next, the system processes this data using an algorithm, which sets up rules for comparing images to one another, to generate a template (a digital representation of the biometric sample). The system then stores this template for future comparison, either in a database or on portable media (such as a smart card).

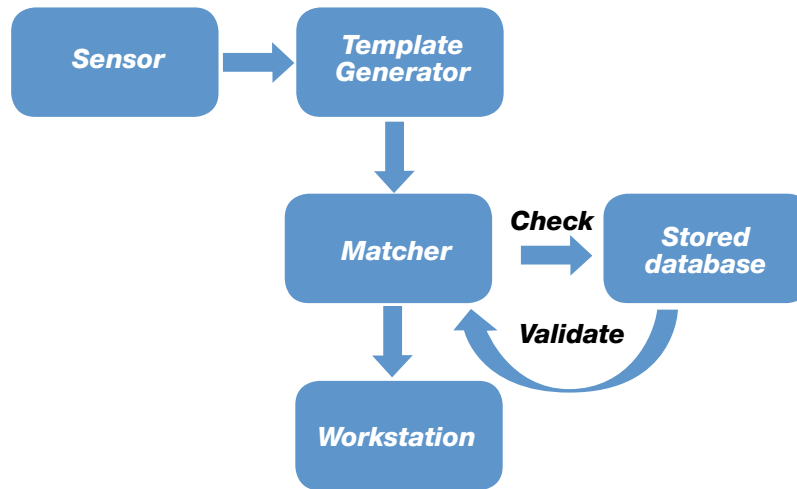
Figure 1: Basic Biometric Enrollment Process



The second process is called *matching*, or the process of identifying an individual. (See Figure 2.) In this process, the sensor captures the biometric sample of the individual to generate a template, which the system then matches against the existing templates that are already in the database. If the biometric sample scores above a particular scoring threshold,

then the system reports that it has established a match. It then sends the results to a user’s workstation, which manages them as output for any specified use (which could be anything from granting access to a controlled area to producing identification items such as cards, passports, and visas).

Figure 2: Basic Biometric Matching Process



BE 2.0 is a software platform that takes inputs from the hardware sensor and matches them using third-party algorithms. BE 2.0 is agnostic, meaning that it can support sensor hardware and biometric algorithms from virtually any vendor. This distinguishes BE 2.0 from its competitors in the marketplace, which are often sold as integrated solutions in which the hardware, software and algorithms come packaged together and limit the customer’s ability to modify or upgrade one or more of those components.

Multimodal Fusion

Historically, the biometrics space has been marked by in-fighting as to which biometric is the “best” to use for verification and identification. For example, proponents of fingerprints value their widespread availability and non-intrusiveness, while detractors point to the fact that fingers develop wear and scars over time, which might inhibit a successful match. This in-fighting has led to most biometric systems being unimodal, which means they support one kind of biometric input (i.e., fingerprint, iris, or face). (See Figure 3.)

Figure 3: Unimodal biometric system example schematic



Fingerprint



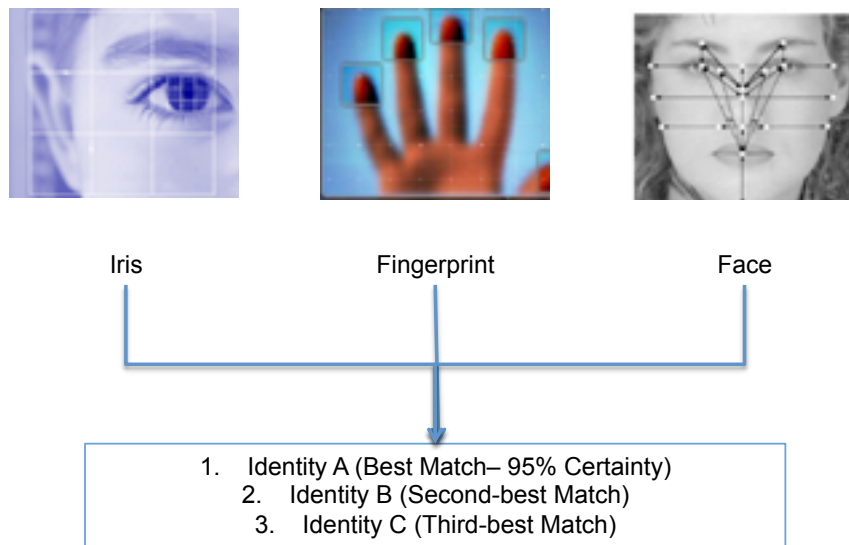
Identity

Product and Technology Overview

BE 2.0 is a biometric software marketplace leader in supporting multimodal biometrics, meaning that it can support several biometric inputs at once. In other words, BE 2.0 can process biometric inputs from many of a person's traits — then, depending on the quality of the input and the strength of the algorithm used to process the input, it can fuse those results

together into a “weighted average” – type score to provide more accurate results than a unimodal system can provide. (See Figure 4.) This means that BE 2.0 can support any biometric a customer would like to use-- from traditional biometrics such as fingerprints and irises, to emerging biometrics such as DNA and palm veins.

Figure 4: BE 2.0 Schematic



Custom Database

Once a system has a database of biometric information, its users can use it either to verify identity or to determine identity.

In *verification*, the user essentially asks the system: “Is this person who they say they are?” The system then captures the biometric data of the subject and compares it to the biometric data it has associated with that person’s record. The output is a yes or no answer (e.g., “Yes, this is David Morris,” or “No, this is not David Morris”). This process is sometimes called “1:1 matching.”

In *identification*, the process is somewhat more complex. Here, the user asks the system: “Who is this

person?” The system captures the biometric data of the subject and then compares it to every record in its database. Depending on the size of the database, this can take a very long time. The output is a record match (e.g., “This is not David Morris; it is Mark Jones”). This process is sometimes called “1:N matching.”

A key feature of BE 2.0 is that it optimizes the design of both the data and the database in order to significantly speed the time required to identify a person using biometric inputs. Depending on the size of the database and the type of input being captured, the time saved can enable authorities to detain threatening people in real time.

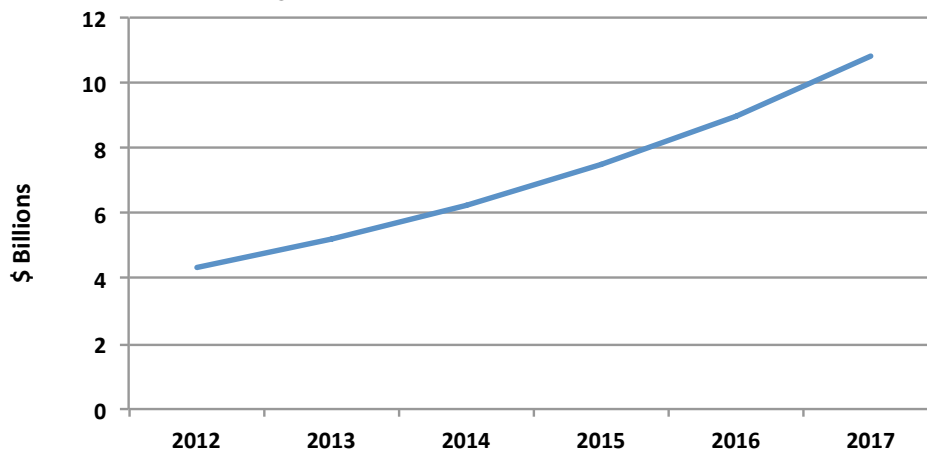
The biometric industry is growing rapidly due to new government projects, establishment of biometric standards, and growing demand from the enterprise segment.

Current biometric system solutions are imperfect, as they can be inaccurate, slow, lack user friendliness, difficult to change, and fail to offer cloud access.

Growth

Though the recent economic downturn negatively affected the biometrics industry by delaying large-scale government projects, the industry has begun to rebound. Leading biometric industry analyst Acuity Market Intelligence, projects that the global biometrics market will grow to nearly \$10.8 billion by 2017, representing a CAGR of approximately 20%. (See Figure 5.) This growth has several drivers.

Figure 5: Biometrics Market Growth



Source: Acuity Market Intelligence

New Government Projects

All around the world, governments are engaging in large civil biometric projects, mainly to improve national security.

- In 2009, the Afghan government started to collect the fingerprints, iris scans, and facial images of Afghan national security forces to combat infiltration by hostile forces. The project has now expanded to provide biometrically backed identification cards to approximately 1.65 million Afghans.
- The largest biometric process currently underway is in India, where the government intends to provide millions of Indians with biometrically verified identification numbers. The goal of

this project is to counter corruption with public funds, monitor bank transactions, and track the movements of suspected terrorists.

- China also recently began a large-scale biometric project, storing its citizens' faces, fingerprints and other biometric features on a smart chip embedded in their passports.

Establishment of Biometric Standards

Although the risk of terrorism and the perceived benefit of biometrics in mitigating that risk have both been understood for a long time, until recently the ability of biometric solutions across organizations to be interoperable and communicate with one another has been challenged by a lack of reliable standards.

Biometrics Industry

This meant that often, one government agency was not able to share its information with another. This limited the network effects of the data and correspondingly diminished the value of biometrics systems to these organizations.

This has begun to change. Last year, the American National Standard for Information Systems and the National Institute of Standards and Technology (“NIST”) published the updated “Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information” standard (“ANSI/NIST ITL1-2011”). Accordingly, the FBI and DOD expanded their implementation of ANSI/NIST ITL1-2011, called the Electronic Biometric Transmission Specification, to include additional biometric data. The widespread proliferation of standards will improve the network effects of the data, thereby enhancing the value of capturing and managing biometric data.

Consumer Demand

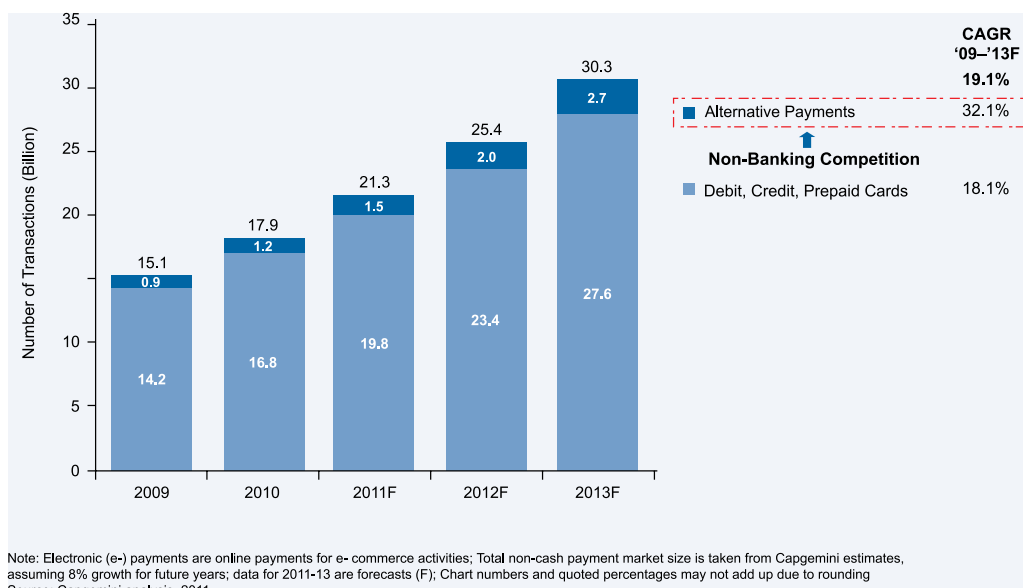
Finally, we note that demand for enhanced accuracy in identity verification is no longer limited to governments. Consumers’ trust in financial

institutions has eroded, and they are growing increasingly apprehensive to use personal data in online transactions due to the risk of information loss. Recently, MasterCard, Visa, and large U.S. banks were involved in a data breach through a third party payment provider, Global Payments, Inc., which put the personal information of about 1.5 million cardholders’ accounts at risk.

Despite security concerns, electronic payments continue to increase worldwide. Acuity Market Intelligence’s analysis of independent third party data estimates global e-payments will grow at a CAGR of 19.1% to 30.3 billion transactions by 2013. (See Figure 6.)

In addition, the dramatic rise of smartphones has created a technology infrastructure that has the ability to conduct financial transactions from virtually anywhere, and a consumer that wants the security to be able to utilize that infrastructure with confidence. This need is driving interest in solutions that improve customers’ confidence that their online information is secure.

Figure 6: Global Electronic Payments



Source: Acuity Market Intelligence

Industry Pain Points

The biometric industry currently faces a number of issues for potential biometric system adopters.

Inaccuracy

Most biometrics solutions are unimodal, and unimodal solutions have accuracy issues. This occurs for several reasons. First, every biometric has its own inherent error rate—for example, according to NIST, over 2% of the US population does not have a legible fingerprint, and therefore cannot be enrolled to a fingerprint database at all. In addition, outside influences, such as high ambient light, can often compromise individual biometric images and render a sample useless. Last, different biometric matching algorithms may have varying levels of accuracy. Perhaps most importantly, however, people trying to defeat a unimodal system have a straightforward and easy to understand path to success. This is because, in order to falsely pass through a unimodal system, an individual only has to emulate one biometric.

Slow Matching Speeds

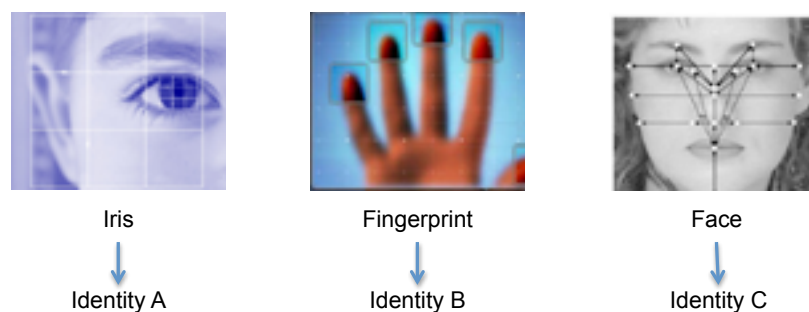
As discussed above, 1:N matching can be a very slow process if a database is sufficiently large. This can make real-time identification of potential threats impossible. Say, for example, an airport wanted to identify people using facial scanning against a comparison database the size of the FBI's database

of fingerprints (which has over 70 million records). Though there are many algorithms that advertise comparison speeds of 400,000+ records per second, those speeds are usually limited significantly by the throughput of the database search architecture. Because the search architecture is usually meant for alphanumeric inputs rather than images, it usually limits the system's performance in matching biometric images significantly. If the search architecture limited comparison to a more-realistic 10,000 records per second, it would take nearly 2 hours to identify an unknown person as belonging to that database. In a high-traffic environment (such as an airport), the person of interest would be gone by the time the system completed its identification.

Lack of User Friendliness

Biometric systems users, such as security officials, typically need fast and user-friendly outputs from their systems. Therefore, these systems need to be easy to manage and administer without compromising quality. This is not often the case in the marketplace today. As an attempt to gain enhanced accuracy, many unimodal systems have moved to a siloed multimodal solution. However, these systems are not fully interoperable, so they cannot return fused results; in other words, a system with three siloed input sensors may return a different match for each modality. (See Figure 7.) This counterintuitive result can cost security officials valuable time to process.

Figure 7: Siloed Unimodal Biometric System Example Schematic



Biometrics Industry

Closed Systems

Most biometric hardware and algorithms available are locked into proprietary means of encoding data. As a result, customers can often only add to these systems by working with the original vendor, which makes these systems more difficult and costly to change.

No Cloud Access

Given the possibility of having private information compromised, companies (particularly financial institutions) are reluctant to use the cloud for storing sensitive information. Although these companies would like to begin using biometrics to protect sensitive financial and biographical information, there remains the possibility that the biometric database will itself be hacked, exposing critical customer information to risk. Currently, there is no solution in the marketplace that is able to alleviate that risk, which is delaying the entry of several enterprise-level customers to both cloud services as well as the biometric industry.

ImageWare's Solution: BE 2.0

BE 2.0 provides enhanced accuracy, speed, user friendliness, openness and cloud access over the prevailing biometrics software solutions in the marketplace.

Accuracy Through Multiple Modalities

The fact that BE 2.0 is multimodal enhances the accuracy of its results. A 2005 NIST / Michigan State University study (co-authored by Michigan State professor Anil Jain, who is considered one of the industry's thought leaders) approximated the accuracy benefits of a multimodal system over leading unimodal systems. The three unimodal systems the researchers tested averaged equal error rates of approximately 3.4%. By contrast, a fused multimodal system that weighted all of its inputs equally averaged an equal error rate of approximately 1%. This represents an accuracy improvement of over 70%.

In addition, people actively trying to deceive multimodal biometric systems are much less likely to be successful, because to do so would require (for example) falsifying a fingerprint, an iris and a voice, as opposed to just one of those biometrics.

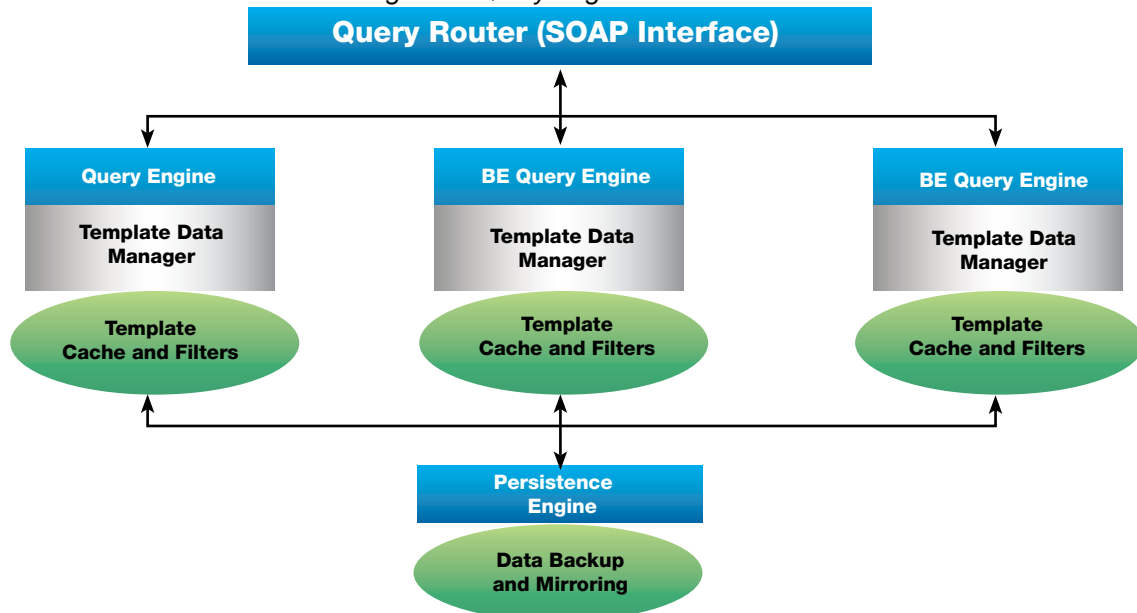
Real Time Database

As discussed above, speed is a major issue with biometric identity determination, mainly because of slow database throughput. To address this, the Company created a multimodal biometric database specifically intended to match biometric images. (See Figure 8.)

When a user queries the BE 2.0 database, the Query Router distributes it across multiple Query Engines (sometimes called "striping"), which drives performance by utilizing multiple machines at the same time. The router uses a standard Simple Object Access Protocol ("SOAP") Interface to communicate with the query engines. Next, the Template Data Management Tool processes the queries and caches key data for rapid retrieval. Finally, the Persistence Engine performs active cache backup and distributes data across multiple machines.

The Company has not yet been able to articulate the specific speed benefit of its approach through testing, as the exact benefit will rely on a variety of factors, including sensor input accuracy, algorithm speed, and workstation processor speed.

Figure 8: Query Engine Architecture



ImageWare's Solution: BE 2.0

User Friendly

BE 2.0's fusion feature offers straightforward results to time and decision constrained users. The fused output of BE 2.0 might show probability scores of how likely a person's identity is to be correct, allowing a security official to quickly determine which follow-up questions to ask in order to gain satisfaction that the subject does not pose a security risk. (See Figure 4, on page 7.)

Open Architecture

As noted, BE 2.0 is an open and agnostic platform; this flexibility allows ImageWare to rapidly adapt to evolving customer needs. BE 2.0 is also modular, meaning that a customer can maintain its ability of ingesting new third party products.

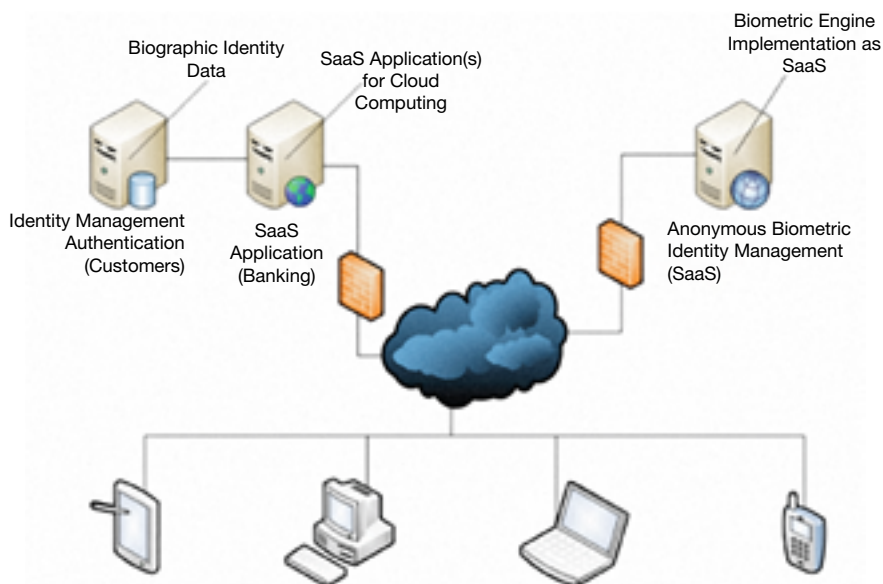
A key benefit of the openness of the Company's solution is that it should comfort certain prospective customers. Customers who are very concerned about having ongoing support (and who would therefore otherwise tend to seek out large, stable, well-capitalized providers) should feel more secure knowing they can always access their data even without ImageWare's help.

Cloud Access

ImageWare has developed proprietary anonymous biometric identity management technology, which enables it to protect user privacy by capturing, managing, and storing its biometric data without matching it to biographic information. ImageWare assigns a unique identifier (or "token") to each set of biometrics. Whenever a user requests an identification or verification process, the system uses the token to find the biometric information needed for that particular match. (See Figure 9.)

This feature is especially relevant to the emerging cloud market. For example, a bank can have biographical identification of its customers in an ImageWare database while maintaining financial account information separately. Since the token used to associate the data from one database to another is completely anonymous, a hacker would need to break into both databases to associate the biographical information with the financial information. This feature can work to enable biometric authentication of online transactions, and may be able to prevent fraud and costly data breaches.

Figure 9: Anonymous Identity Verification



Competition

The biometrics industry is still immature and highly segmented, and includes hardware, software and algorithm providers, as well as systems integrators.

The biometric industry is filled with players of all sizes, most of which provide some component (either hardware, software, or algorithms) of a biometric system. In addition, many of the smaller players in the space work directly with large systems integrators, as discussed earlier. This suggests the potential for industry consolidation, which has recently been realized as large companies such as 3M and Safran have acquired small biometrics companies.

Among ImageWare's closest competitors, only 3M Cogent provides a combination of software and hardware solutions. Aware and Daon are mainly software companies, while Safran is primarily a hardware provider.

3M Cogent

3M's historical involvement in the biometric security space has been in security credential issuance and authentication hardware. In 2010, it acquired Cogent, a manufacturer of fingerprint and palmprint identification systems, for \$943 million. With this acquisition, 3M complemented its existing product offering and expanded its reach in the law enforcement markets. One of 3M Cogent's flagship products is the Automated Palmprint and Fingerprint Identification System, a software platform that captures, encodes, and compares fingerprint and palm print images electronically.

Unlike ImageWare, 3M Cogent's solutions are closed and proprietary, which inhibits their customers' ability to upgrade or modify them.

Recently, 3M Cogent announced a 10-year contract to supply LiveScan booking systems and biometric identification solutions to the Hong Kong Police Force.

Aware

Aware primarily provides software development kits that users can adapt to a platform (rather than plug-and-play solutions) and software engineering services. The company's products are interoperable, but only support fingerprint, facial, and iris modalities. The company has been developing imaging and biometric technologies for the past twenty years. Aware's biometrics and imaging product lines delivered more than \$14 million in revenue in fiscal year 2011. Aware is well capitalized, having recently sold patents related largely to legacy businesses to Intel for \$75 million.

Last year, Aware announced it was developing a product called the Universal Automated Booking Station, a biometric enrollment application for use by the U.S. Department of Justice. In 2011, the TSA awarded Aware a contract to provide a biometric services platform for a fingerprint system. Most recently, Aware announced three large-scale border management systems project wins through prime contractors in Europe, the Middle East, and North America.

Daon

Daon is a private Irish company with business concentrated in foreign markets. (This is partially because the United States government shows preferential treatment to domestic providers for government contracts.) Daon provides identification and verification services and software, including the DaonEngine, a multimodal, open, scalable identity services platform that is also capable of some level of biometric fusion. Other products include the DaonEnroll, DaonAnalytics, and Credential Connect.

Competition

Daon's capitalization is secure, as its principal owner, Dermot Desmond, has an estimated net worth of over \$2 billion.

Safran

French aerospace and defense company Safran solidified its security division by acquiring L-1 Identity Solutions, Inc., a U.S. provider of biometric and identity management solutions, in 2011 for nearly \$1.1 billion. L-1 joined Safran's existing security business, Morpho, and was renamed MorphoTrust. The company provides ID issuance solutions,

biometric enrollment, ID management, and other data verification systems. Its biometrics solutions are based on face, finger, and iris recognition technologies.

L-1 generated revenue of more than \$450 million in 2010. Currently, MorphoTrust has approximately 1,200 employees and annual revenues of approximately \$400 million. The company also has a nationwide network of more than 1,200 ID service centers. Some of the company's stated partners include the U.S. Department of Defense and the U.S. Department of State.

ImageWare’s Intellectual Property

ImageWare has historically been a very strong developer and filer of intellectual property. By querying MDB Capital’s proprietary PatentVest™ database (“PatentVest”), we have mapped ImageWare’s patent filings to gain an understanding of their patent position, as well as the landscape of the overall biometrics industry.

IP Capability Matrix

Criteria

We measure corporate capability with respect to intellectual property goals on two dimensions: the ability to protect the Company’s existing product portfolio, and the ability to generate future licensing revenues from related technologies.

In order to develop appropriate benchmarks for these dimensions, we consider which phase of its lifecycle a company is in. We broadly categorize technology growth companies as falling into three phases:

- **Development:** Marked by advanced prototypes, as well as the beginning of third party validation of its technology.
- **Validation:** Marked by OEM or channel partner agreements, as well as joint development agreements.
- **Commercialization:** Marked by product launch, as well as rapid revenue growth.

Our assessment is that ImageWare is currently at the end of the “Development” phase of its lifecycle, and it is quickly moving into the “Validation” phase.

We then develop qualitative scores across these dimensions using data from PatentVest. In particular, we consider the relative age of a company’s intellectual property portfolio and the breadth of the

technology focus, as measured by the distribution of a company’s innovations across a number of USPTO primary classifications.

At the “Validation” phase, we would expect to see a company score a 5 along the “Protect Existing Product Portfolio” dimension, and a 2 along the “Develop Strategic Intellectual Property” dimension.

Scoring

We rate ImageWare as being ahead of the typical development stage company on both dimensions. (See Figure 10.)

Figure 10: IP Capability Assessment



- **Protect Existing Product Portfolio:** On this dimension, we measure the progress of the Company in ensuring that it is effectively protecting its technology from infringers. A company can achieve that by exhaustively considering every patentable dimension of their innovations, including all materials, processes, logic, and applications.

ImageWare's Intellectual Property

We rate ImageWare a 7 out of 10 on this dimension. The Company was the first to file patents on multimodal biometrics analysis and processing, so its patents in this area are foundational in nature. Consequently, we believe that ImageWare has protected itself well in this regard. We would like to see the Company continue to buttress that position by filing more related patents, since there is significant strength in numbers when it comes to patent portfolios. Management has indicated that it intends to file 30-40 additional patents related to biometric controls of cloud access and performing multimodal fusion in different software environments.

- **Develop Strategic Intellectual Property:** On this dimension, we measure the progress of the Company in patenting ancillary technologies that may not relate directly to its own key products, but may have value within a broader eco-system. IP of this sort may have licensing or transactional value separate and apart from the core business.

Perhaps the pre-eminent example of a firm that has effectively used this capability is IBM, which generates over \$2 billion in IP licensing revenue per year, and recently was capable of selling several

thousand patents to companies with significant IP needs, including Facebook and Google.

We rate ImageWare a 3 out of 10 on this dimension. ImageWare has not yet generated meaningful licensing revenue from its foundational IP, but our conversations with management have demonstrated to us that their engineers have a patent pipeline that should be able to do so in the future.

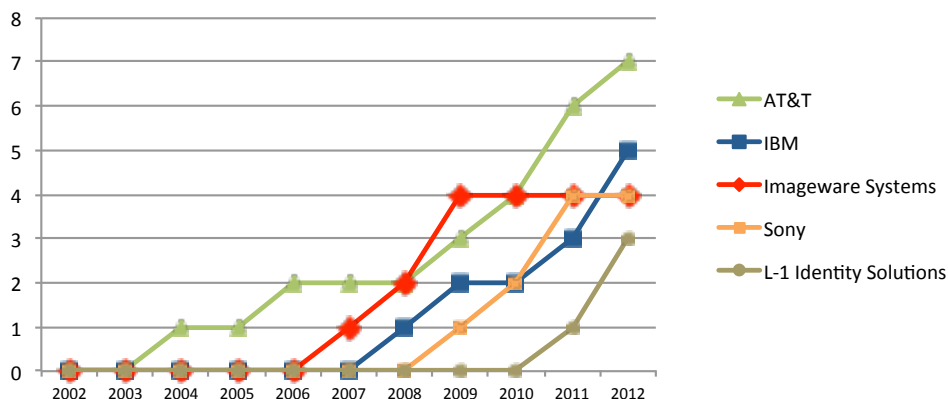
IP Landscape

In order to determine the intellectual property landscape in this space, we performed a search in PatentVest for patents that referenced the keywords “multimodal biometrics.” (Please note that all keyword searches are by their nature incomplete, since often patents may extend to cover complementary standards, products, or even industries.)

The first thing we note is that there are simply not many companies innovating in the multimodal biometrics space. The top 5 patent holders hold a mere 23 total patents relating to that term. These holders include one direct competitor (L-1 Identity Solutions), as well as three large players who do not do significant work in the biometric security space. (See Figure 11.)

We then examined all “multimodal biometrics” patents

Figure 11: Top 5 patent holders in “multimodal biometrics”



ImageWare's Intellectual Property

that are not held by ImageWare, to determine whether or not there is a “foundational” patent that would significantly impact ImageWare’s ability to continue to innovate in the space. Our research found that such a patent does not appear to exist. The majority of the patents in this space deal with consumer applications, including personal computing “presence detection,” which is a way for a personal computer to provide different computing environments for different users. (Indeed, the most-cited patent in all of multimodal biometrics is held by Nuance Communications, the company that provided the technology behind the Siri voice interface to Apple for use in the iPhone 4S.)

Thus, we find that ImageWare has significant “white space” to continue innovating within the field of multimodal biometric security.

IP/Product Strategy

The Company has told us it is actively working towards filing 30-40 new patents within the next 10 months, to protect its new innovations with respect to anonymous biometric identity management (its new feature that will enable its deployment into the emerging cloud market). We believe that biometrically-controlled cloud access may hold significant appeal to private enterprises, which should be a source of significant growth in the biometrics space.

ImageWare has not shared its full prospective IP strategy in terms of specific feature functionality, which is understandable, since to do so would be tantamount to share its plans on future product offerings and developments. That said, ImageWare clearly prioritizes its intellectual property strategy, so we will continue to monitor its patent filing progress closely.

Company Competencies

ImageWare has significant competencies in research and development, production, and customer support.

The Company is working to develop greater competency with respect to sales and marketing, especially by augmenting those competencies with new staff.

Research and Development

ImageWare has been a market leader in working with multimodal biometrics since 1999. Consequently, it has significant capabilities in research and development. That the Company recently introduced version 2.0 of its biometric engine, employs 22 engineers, and has retained key inventors (such as CEO James Miller and CTO David Harding) suggests that it remains well positioned on the R&D front.

Production and Manufacturing

Since the Company is a software vendor, its primary production need is to customize software for its customers. ImageWare has demonstrated a capability to perform this customization in a timely fashion. In addition, the Company's engineers continue to work to update the product to reduce the level of customization that will be needed for its software in the future.

On occasion, a customer will ask ImageWare to perform as a systems integrator and load its software onto 3rd party hardware. ImageWare has demonstrated its ability to perform that task within a month.

Sales and Marketing

ImageWare can either sell its product directly to customers, or it can sell through a value added reseller or a prime contractor. In the biometrics industry,

sales success is contagious because prospective customers tend to value stable providers who can provide ongoing support. Therefore, the Company's ability to commercialize BE 2.0 in the near term will be important for driving future sales.

We are not yet in a position to evaluate ImageWare with respect to its sales capability, since until recently the Company has primarily been focused on releasing BE 2.0. In addition, it is possible that customers deferred their purchasing decisions until BE 2.0 was completed, which would have impacted sales of the previous generation of the product.

At the moment, ImageWare has no key marketing personnel, so we assess that it does not have significant capabilities with respect to this function. The Company has recently begun searching for a key marketing executive, however, so this may change soon. We will continue to monitor ImageWare's progress in developing this capability.

Order Fulfillment

The fact that ImageWare often works through systems integrators reduces its responsibility for fulfilling customer orders. When it has directly fulfilled customer orders in the past, the Company has demonstrated that it can deliver integrated solutions in a timely fashion.

Customer Support

The Company has several customers that have been with it for several years (including over a decade of service for the State of Arizona), which indicates that it has strong capabilities for customer support. In addition, the agnostic nature of BE 2.0 gives ImageWare an advantage with respect to customer support, as it means that the Company can be flexible enough to adapt to changing customer hardware or algorithm needs.

Recent Developments

ImageWare recently released BE 2.0.

ImageWare recently closed a contract with Los Angeles World Airports for a value of about \$1 million.

ImageWare recently raised \$10 million in equity financing, which strengthened its balance sheet significantly.

Biometric Engine 2.0

As discussed above, in May 2012 the Company introduced version 2.0 of its flagship biometric engine. The Company has rolled out the new version to its existing (mainly government) clients.

Los Angeles World Airports Agreement

In January 2012, Los Angeles World Airports, operator of Los Angeles International Airport, Ontario International Airport, and Van Nuys Airport, ordered a suite of ImageWare’s biometric identity management and credentialing software to identify airport employees, contractors, and police. The project had a total value of approximately \$1.0 million; of this amount, it has already collected over \$400,000 in billings, though it has not yet recognized the revenue.

We view this project as an important milestone for the Company. Once again, sales success in this industry begets more success, as current customers tend to validate providers in the eyes of prospective customers. Therefore, achieving a sale as visible and competitive as this one continues to provide customer credibility to ImageWare.

Capital Structure Changes

In December 2011, ImageWare closed a \$10 million equity private placement, with MDB Capital Group as sole placement agent. As part of this private placement, the Company converted its preferred stock and convertible debt. The transaction gave the Company a strong cash reserve and a debt-free balance sheet.

We view this financing as a key intermediary step for ImageWare between its development phase and its commercialization phase. Having a longer cash runway and stronger balance sheet will make ImageWare a more attractive partner for large enterprise and government customers, as well as for major prime contractors such as Lockheed Martin and Unisys.

Financial Position

BE 2.0 has significant revenue potential with 80% gross margins on the upside.

ImageWare has \$5.2 million cash on hand, so the Company may need additional financing to support rapid sales growth.

If timing issues stand in the way of significant near-term earnings announcements, we believe the principal drivers of the stock price will come from announcements relating to contract wins and other key milestones.

Impact of Customer Wins

Based on a survey of 4-5 existing deals with government customers, we estimate the following deal economics to ImageWare.

Typical maintenance revenues from a customer average approximately \$400,000 per year, although they can range from approximately \$200,000 to \$600,000, depending on the specific implementation. This number represents approximately 15-18% of the initial software sale. The precise revenue per customer win is a function of the number of workstations and servers the Company's software is placed on, as well as the expected number of biometric enrollments. Typical gross margins range from 65% to 95%. The lower-end results from the Company reselling hardware as part of the solution, which is a practice it is attempting to avoid in the future. Consequently, we expect ImageWare's gross margins to be above 80% going forward.

According to ImageWare, because of revenue recognition rules, its contract wins may take time to appear as revenue in its financial statements; however, its cash receipts should appear as deferred revenue

before recognition, giving investors an opportunity to track the Company's revenue progress.

Cash Position

According to its most recent 10-Q filing, at 3/31/12, Imageware had approximately \$5.2 million in cash and cash equivalents on hand. Its cash burn rate was approximately \$2 million over that same quarter. The Company has provided guidance that a portion of that \$2 million was related to non-recurring compliance audit charges, and that only approximately \$1.5 million of that amount should recur.

We note, however, that ImageWare is also looking to hire key personnel, which will tend to increase burn rate somewhat. We anticipate that the Company will hire some key marketing personnel; in addition, it has already brought on board some additional sales and engineering staff. We expect additional headcount to cost \$200,000 per quarter.

In addition, the Company has provided guidance that its capital expenditures for the next year should be approximately \$200,000, or approximately \$50,000 per quarter, mostly to be spent on third party hardware for testing and demonstration purposes.

In total, then, we estimate the Company's quarterly burn rate at approximately \$1.75 million. We note, therefore, that if ImageWare cannot effectively commercialize BE 2.0 in the near term, the Company may need additional financing to support its growth.

Key Drivers of Stock Price

While ImageWare does not currently generate significant positive earnings, we believe that they may do so in the near term. However, it is important to note that, due to the nature of government contracts and prime contractor relationships, the timing of

Financial Position

ImageWare's cash flows is uncertain. In addition, due to revenue recognition accounting standards for software sales, ImageWare may not be able to immediately recognize earnings even after it receives payment.

Even in the absence of positive earnings releases in the near term, we believe that certain key announcements could have a material positive impact on the Company's share price.

Contract Wins

If the Company is able to announce contract wins with major Fortune 500 companies or government institutions exclusive of an integrator, investors should reduce the risk premiums they are currently placing on the Company's revenue forecasts, which would have a material positive impact on the stock.

Additional Subcontractor Agreements

If ImageWare is able to announce additional subcontractor agreements with other integrators, investors should view that as additional validation of the Company's technology and reduce their technological risk premium accordingly.

Channel Partner Agreements

There are multiple large players across a variety of industries that may find value in integrating ImageWare's solutions into their overall product. Some possible industries include Cloud Security, Identity Card Management, Biometric Algorithms, amongst others. If the Company is able to establish an agreement within one of these verticals, they would gain additional credibility within that industry and increase their access to customers.

IP Commercialization

If ImageWare is able to commercialize its IP portfolio, investors should reduce the risk premiums they are currently placing on the Company's revenue forecasts, which would have a material positive impact on the stock.

Risk Factors

As a small company that does not yet have significant revenue, ImageWare faces significant market, technology, and management risks.

ImageWare has a market capitalization of approximately \$60 million. The Company currently generates small licensing and maintenance revenues, and it is not generating earnings. We strongly recommend that investors evaluate their risk profile before deciding whether or not to invest in ImageWare.

Within that context, we believe the following constitute the primary risks to investing in ImageWare.

Competitor Risk

The biometrics industry is very competitive, with several players, some much larger than ImageWare, working to develop and enhance new technologies. Significant technological advances by a competitive software platform could pose a risk to ImageWare's future profitability.

Although we believe the Company has a technological advantage over its competitors in the biometrics space, we also note that this technological advantage may not be enough to lead it to profitability. Large players can use significant market power and customer relationships to avoid losing competitive projects to a small company such as ImageWare.

Customer Risk

Governments and enterprises may be risk averse when making decisions concerning security and privacy matters. These large players may be inclined to rely on trusted names or strong personal relationships to make purchases. Moreover, winning government contracts can be a challenging, highly regulated, and time consuming process.

All of these factors will make it challenging for ImageWare to compete. The Company's work with integrators mitigates this risk somewhat, however, by putting the face of a larger, more established company on ImageWare's technology.

Forecasting Risk

Government sales cycles can be long and uncertain, due to the vagaries of government budgeting and the politics of vendor procurement. In addition, being a small company, ImageWare frequently performs as a subcontractor, which can put the Company at the mercy of the prime contractor's timing and conditions.

These factors mean that ImageWare may not have visibility into its own future revenues, making it difficult to project cash flows and provide earnings guidance.

Financing Risk

Though the Company has adequate cash reserves to finance its operations for the immediate future, there remains a risk that it will need to raise additional financing if it cannot commercialize BE 2.0 in the near term.

Intellectual Property Risk

Many new, key patents in ImageWare's portfolio have not yet been granted. Though we have no specific reason to believe the patents in its existing application pipeline will not ultimately be granted, we view the patent portfolio as the most important driver of the Company's long-term value, so we encourage investors to consider this risk.

Stock Risk

Because ImageWare is not yet a profitable, mature company, its stock is likely to be very volatile around earnings announcements. In addition, the Company's stock has little market liquidity.

Risk Factors

Acquisition Risk

The biometrics industry has recently been marked by consolidation, including Safran’s recent purchase of L-1 Identity Systems for about \$1.1 billion and 3M’s purchase of Cogent Systems for \$943 million.

With a current market value of approximately \$60 million, ImageWare could represent an attractive acquisition target for a larger player. Such an acquisition may limit an investor’s return on ImageWare’s stock.

New Technologies Risk

There is also a risk that a significant improvement in a single modality (such as DNA) could mean that this one modality alone can provide sufficient accuracy and speed for governments and enterprises. Such an improvement could render multimodal biometrics irrelevant, reducing the value and outlook of BE 2.0.

Management Team

ImageWare has a strong and experienced management team, led by CEO James Miller. (See Figure 12.)

Figure 12: Biographies of Key Management

James Miller CEO & Chairman of the Board	<ul style="list-style-type: none"> • President, ImageWare Systems, Inc. • Director & Senior VP, Oak Industries, Inc.
Wayne Wetherell CFO	<ul style="list-style-type: none"> • VP of Finance, ImageWare Systems, Inc. • VP & CFO, Bilsten Corporation of America • Executive, Oak Industries, Inc.
Chuck AuBuchon VP, Business Development	<ul style="list-style-type: none"> • SVP, ImageWare Systems, Inc. • SVP, Card Technology Corp. • SVP, Gemplus International S.A. • SVP, Datacard Group
David Harding VP & CTO	<ul style="list-style-type: none"> • VP & CTO, ImageWare Systems, Inc. • Consultant, Access360

ImageWare's board is deep with industry connections. (See Figure 13.) In particular, we note that David W. Carey, the former Executive Director of the CIA, has been a board member since 2007.

Figure 13: Biographies of the Board of Directors

James Miller CEO & Chairman of the Board	<ul style="list-style-type: none"> • CEO and Chairman, ImageWare Systems Inc. • Director & Senior VP, Oak Industries, Inc.
John Callan Director	<ul style="list-style-type: none"> • Director, ImageWare Systems Inc., since 2000 • Business strategy consultant in imaging and logistics
David W. Carey Director	<ul style="list-style-type: none"> • Director, ImageWare Systems Inc., since 2007 • Former Executive Director, CIA
John Cronin Director	<ul style="list-style-type: none"> • Managing Director and Chairman of ipCG • Served as the top inventor at IBM for 17 years
Steve Hamm Director	<ul style="list-style-type: none"> • Retired PricewaterhouseCoopers national partner-in-charge • Director at Chromavision and at Aspen Holdings
David Loesch Director	<ul style="list-style-type: none"> • Director, ImageWare Systems Inc., since 2001 • Retired Assistant Director in Charge of the Criminal Justice Information Services Division of the FBI

Exhibits

ImageWare Systems, Inc.: Historical Balance Sheet

ImageWare Systems, Inc.: Historical Income Statement

ImageWare Systems, Inc.: Historical Statement of Cash Flows

ImageWare Systems, Inc.: Historical Balance Sheet						
	(\$ in thousands)					
	4Q10	1Q11	2Q11	3Q11	4Q11	1Q12
Assets						
Cash & Near Cash Items	103	623	488	267	6,773	5,223
Accounts & Notes Receivable	239	280	311	305	348	376
Net Inventories	12	28	22	30	45	83
Other Current Assets	57	68	73	74	66	125
Total Current Assets	411	999	894	676	7,232	5,807
Net Fixed Assets	19	17	21	18	18	87
Net Intangible Assets	78	75	71	67	63	59
Goodwill	3,416	3,416	3,416	3,416	3,416	3,416
Other Long-Term Assets	58	60	60	59	58	58
Total Long-Term Assets	3,571	3,568	3,568	3,560	3,555	3,620
Total Assets	3,982	4,567	4,462	4,236	10,787	9,427
Liabilities & Shareholders' Equity						
Accounts Payable	1,161	1,143	1,148	1,104	1,103	735
Deferred Revenue	1,073	1,139	747	1,473	1,066	1,445
Accrued Expenses	1,822	1,826	2,151	2,082	2,005	1,782
Notes Payable to Related Parties	110	110	110	110	110	65
Other Short-Term Liabilities	241	102	-	-	-	-
Total Current Liabilities	4,407	4,320	4,156	4,769	4,284	4,027
Long-Term Liabilities	1,427	1,967	2,642	3,228	-	-
Derivative Liabilities	15,653	22,926	18,528	11,573	11,824	5,772
Other Long-Term Liabilities	401	425	442	431	391	404
Total Long-Term Liabilities	17,481	25,318	21,612	15,232	12,215	6,176
Total Liabilities	21,888	29,638	25,768	20,001	16,499	10,203
Share Capital & APIC	85,425	86,174	86,444	86,525	102,401	116,139
Retained Earnings & Other Equity	(103,331)	(111,245)	(107,750)	(102,290)	(108,113)	(116,915)
Total Equity	(17,906)	(25,071)	(21,306)	(15,765)	(5,712)	(776)
Total Liabilities & Equity	3,982	4,567	4,462	4,236	10,787	9,427

Image Ware Systems, Inc.: Historical Income Statement											
(\$ in thousands, except per share data)	1Q10	2Q10	3Q10	4Q10	FY10	1Q11	2Q11	3Q11	4Q11	FY11	1Q12
Total Revenue	2,028	1,151	1,422	1,210	5,811	1,921	1,499	1,060	994	5,474	1,121
Cost of Revenue	775	398	447	377	1,997	369	384	292	349	1,394	322
Gross Profit	1,253	753	975	833	3,814	1,552	1,115	768	645	4,080	799
General and administrative	697	680	512	657	2,546	507	486	617	717	2,327	944
Sales and marketing	392	381	385	370	1,528	371	361	343	329	1,404	394
Research and development	697	666	576	592	2,531	627	685	683	669	2,664	734
Depreciation and amortization	14	12	13	11	50	7	7	7	7	28	12
Total Operating Expenses	1,800	1,739	1,486	1,630	6,655	1,512	1,539	1,650	1,722	6,423	2,084
Operating Income (Loss)	(547)	(986)	(511)	(797)	(2,841)	40	(424)	(882)	(1,077)	(2,343)	(1,285)
Interest income (expense), net	(242)	(334)	(60)	(487)	(1,123)	(628)	(641)	(686)	(2,896)	(4,851)	(4)
Change in fair value of financing obligation	(229)	744	38	(2)	551	-	-	-	-	-	-
Change in fair value of derivative liabilities	(477)	4,154	506	(4,921)	(738)	(7,273)	4,585	6,955	(297)	3,970	(7,536)
Financing expense	-	-	-	-	-	-	-	-	-	-	-
Loss on debt modification	-	-	(1,100)	-	(1,100)	-	-	-	-	-	-
Other income (expense), net	17	284	12	15	328	5	4	10	6	25	235
Income (Loss) before income taxes	(1,478)	3,862	(1,115)	(6,192)	(4,923)	(7,856)	3,524	5,397	(4,264)	(3,199)	(8,590)
Provision for (benefit from) income taxes	-	197	2	(73)	126	2	2	2	(25)	(19)	-
Net Income (Loss)	(1,478)	3,665	(1,117)	(6,119)	(5,049)	(7,858)	3,522	5,395	(4,239)	(3,180)	(8,590)
Preferred dividends	(99)	(98)	(99)	(100)	(396)	(103)	(99)	(99)	(82)	(383)	(13)
Net Income (Loss) available to common shareholders	(1,577)	3,567	(1,216)	(6,219)	(5,445)	(7,961)	3,423	5,296	(4,321)	(3,563)	(8,603)
EPS diluted	(\$0.07)	\$0.09	(\$0.05)	(\$0.26)	(\$0.23)	(\$0.31)	\$0.06	\$0.09	(\$0.06)	(\$0.13)	(\$0.13)
Weighted Average Shares fully diluted	21,976	38,451	23,754	23,839	23,175	25,318	60,044	57,166	67,989	27,316	67,989

ImageWare Systems, Inc.: Historical Statement of Cash Flows											
(\$ in thousands, except per share data)	1Q10	2Q10	3Q10	4Q10	FY10	1Q11	2Q11	3Q11	4Q11	FY11	1Q12
Cash From Operating Activities											
Net Income	(1,478)	3,666	(1,118)	(6,119)	(5,049)	(7,858)	3,522	5,395	(4,239)	(3,180)	(8,590)
Depreciation & Amortization	14	12	13	11	50	7	7	7	7	28	12
Amortization of debt discount and debt issuance costs	161	270	-	244	675	540	550	566	2,772	4,448	-
Accretion of additional financing obligation costs	71	73	(2)	(68)	74	-	-	-	-	-	-
Loss on debt modification	-	-	1,100	-	1,100	-	-	-	-	-	-
Change in fair value of additional financing obligation	158	(817)	(36)	144	(551)	-	-	-	-	-	-
Reduction in accounts payable from expiration of statute of limitations	-	-	-	-	-	-	-	-	-	-	(230)
Change in fair value of derivative liabilities	477	(4,154)	(506)	4,921	738	7,273	(4,585)	(6,956)	298	(3,970)	7,536
Stock issued in lieu of cash	-	-	-	-	-	13	-	-	-	13	-
Stock based compensation	64	60	60	59	243	77	83	80	49	289	150
Changes in Non Cash Capital	395	185	287	(217)	650	(133)	(178)	602	(188)	103	(94)
Cash From Operations	(138)	(705)	(202)	(1,025)	(2,070)	(81)	(601)	(286)	(1,301)	(2,269)	(1,216)
Cash From Investing Activities											
Purchase of Property and Equipment	(11)	(2)	(4)	4	(13)	(1)	(7)	-	(3)	(11)	(77)
Cash From Investing Activities	(11)	(2)	(4)	4	(13)	(1)	(7)	-	(3)	(11)	(77)
Cash from Financing Activities											
Proceeds from exercised stock options	-	-	-	-	-	4	-	-	-	4	-
Proceeds from exercised stock purchase warrants	200	-	300	-	500	655	-	-	-	655	-
Proceeds from issuance of common stock and warrants	-	-	-	-	-	-	-	-	8,544	8,544	-
Proceeds from issuance of notes payable	250	-	-	5,500	5,750	-	500	-	750	1,250	-
Repayment of notes payable	-	-	-	(4,430)	(4,430)	-	-	-	(1,500)	(1,500)	(45)
Financing costs	-	-	-	-	-	-	-	-	-	-	-
Dividends paid	-	-	-	-	-	-	-	-	-	-	(178)
Cash from Financing Activities	450	-	300	1,070	1,820	659	500	-	7,794	8,953	(223)
Effect of exchange rate on cash	114	8	(152)	54	24	(57)	(27)	65	16	(3)	(34)
Net Changes in Cash	415	(699)	(58)	103	(239)	520	(135)	(221)	6,506	6,670	(1,550)

Disclosures

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