



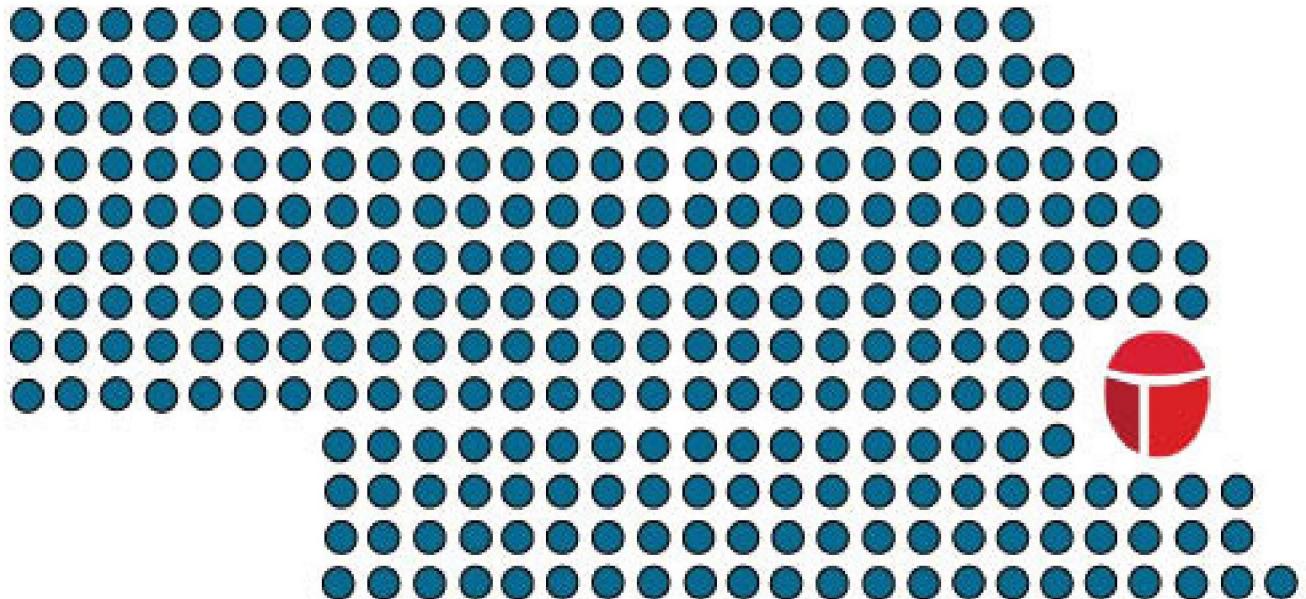
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STRATEGIC ANALYSIS

Automated Antibiogram

- Real time antimicrobial stewardship solution
- Automated software application
- Generates site specific antibiograms
- Integrates into most popular hospital management systems
- Could inform antibiotic usage

As of 28 March 2022
Volume 1

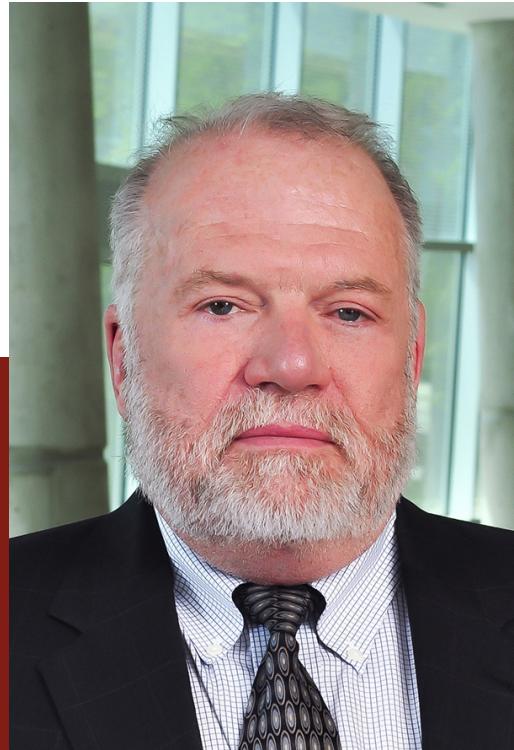


Building the Future

UNeTech is a startup incubator and translational research institute for the University of Nebraska Medical Center and University of Nebraska Omaha that provides funding for projects that fall between basic science research grants and private investment.

From the Director

We all must be better stewards of the powerful drugs that stand between the world and bacterial disaster. The automated antibiogram is a vital new product and the exact solution to keep us all safe.

A handwritten signature in blue ink, appearing to read "David T. Purtilo".

Associate Vice Chancellor for Business Development
Executive Director of UNeTech
David T. Purtilo Distinguished Professor of Pathology & Microbiology
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Executive Summary

Value Proposition

Software that creates real-time updates to antibiograms, allowing doctors to administer more effective treatments and save time by not needing to input data into outdated antibiograms. It will work well for clients that use Epic or Cerner but do not utilize their antibiogram. It also offers a natural language reading feature that none of the competitors do.

Markets

Hospitals/Clinics

- Large Hospitals (greater than 50 beds) 3,852 (U.S)
- Small Clinics (less than 50 beds) 2,238 (U.S)
- The goal of the service is to maintain efficiency within hospitals and therefore saving time which saves lives.
- There are very few if any nursing homes that use an antibiogram
- Definitely an opportunity to capture these markets

Vet Clinics

- 28,8531 vet clinics in the U.S
- Not many vet clinics appear to use an antibiogram

Foreign Markets

- The EU uses EUCAST
- Australia uses an antibiogram but doesn't appear to have a name

Biggest Opportunities

- Easy onboarding with no FDA regulatory compliance concerns
- The software offers real-time data and updates to antibiograms
- Integration with Hospitals' current EMR systems

Biggest Threat

- Other companies could create a very similar product with incremental changes
- Competitors may try to imitate the current unique feature (NLP)
- Hospitals may not be willing to switch data to a new antibiogram system

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Overview

The UNMC Antibiogram is a cloud-based product that can be utilized to help a doctor prescribe the best treatment for a patient with an infection. It does this by telling the doctor what drugs work best and the proper dose size. This is very useful when deciding what to prescribe to the patient and it helps to avoid developing a regional resistance to a certain drug by alternating between several different drugs used. The UNMC Antibiogram also has the ability to process natural language.

A priority market for the Antibiogram is animal clinics. Very few vet clinics currently use an antibiogram and would likely be open to the option. This would work in the same way it works for humans and animal diseases can also develop an immunity.

The second market for the antibiogram is large hospitals. This market, while more profitable, will be much harder to enter. This is because the market is already occupied. Epic Bugsy is the main one followed by Cerner Health. Together these two companies occupy both the large-scale public market and the smaller scale individual market. However, these two companies do not currently have natural language processing capabilities with their antibiograms. This current usage of these two products will make acquiring customers a little harder, but not impossible. The natural language processing would be an additional benefit to hospitals, which, currently, few hospitals possess. A third market can be found in long-term care clinics. This market is also currently occupied and Cerner Health is going to be hard to beat as the products are similar, aside from natural language processing.

External Analysis

Markets

Large Hospitals (greater than 50 beds) 3,852

- Some hospitals have an antibiogram already.
- The ones that do have one do not have a universal code. i.e. you can't take an antibiogram from hospital A and use it in B.
- Significant market here for an Automated Antibiogram. Especially one that is universal and works everywhere
- Would have to convince the hospitals currently using one that this product is better
- The way it looks, this antibiogram may have to be divided into regions because the US is so big. This would also increase adoption rate because it would be more accurate data for a given user.

Small Clinics (less than 50 beds) 2,238

- There are very few if any nursing homes that use an antibiogram
- Definitely an opportunity to capture this market
- The most recent information on this was from 2010 so it's hard to know what today looks like.

Vet Clinics

- There are 28,8531 vet clinics in the US
- Not many vet clinics appear to use an antibiogram
- This is definitely a market that can be captured
- A decree in France passed in 2016 required "an antibiogram before certain critically important antimicrobial agents can be used in veterinary medicine."
- If legislation like this were to pass in the US, this would increase the demand for a universal antibiogram usage.
- Overcoming the "if it ain't broke don't fix it" philosophy should be easier in this market because less clinics currently use one.
- This would also have to be divided into regions because the US is so big. This would also increase adoption rate because it would be more accurate data for a given user.
- Most vet clinics are independently owned
- Vet clinics use software systems. They don't have an antibiogram built-in. They are just used for scheduling and billing.

Foreign Markets

- The EU uses EUCAST
- Australia uses an antibiogram but doesn't appear to have a name
- Same goes for Asia, South Africa, and Egypt to name a few
- No other country/area seems to use a specific system. It's all local systems.

Hospital Systems

We are currently charging UNMC-affiliated hospitals ~\$3k/yr - which is a friendly discount. Large hospital systems have the likelihood spend a one-time fee of ~\$100k plus annual subscription costs for current products like EPIC Bugsy. If a hospital currently doesn't have a software solution, then they pay equivalent FTE for a Pathology Fellow and his/her MD Supervisor for 40+ hours, at least once per year.

Epic Bugsy is used by 29% of acute care hospitals. These hospitals hold 54% of patient records. That 29% includes these major hospitals

- Cleveland Clinic, Ohio
- Mayo Clinic, Rochester, Minn
- Massachusetts General Hospital, Boston
- The Johns Hopkins Hospital, Baltimore
- Cedars-Sinai Medical Center, Los Angeles
- UCSF Medical Center, San Francisco
- Michigan Medicine, Ann Arbor
- UCLA Medical Center, Los Angeles

Epic and Cerner control the overwhelming majority large, (500+ bed) hospital market. These two control 85% with 58% and 27% respectively. Among U.S. acute care hospitals they control 54% of the market. Epic has 28% and Cerner has 26%.

EHR purchases in 2018 outpaced those of the previous two years, with a total of 445 decisions across the hospital spectrum. Helping to fuel those deals was continued consolidation in the healthcare industry. As organizations merge, they often seek to integrate onto a mutual platform – a trend that has benefited Epic and Cerner. Since 2014, a fifth of all EHR switches at acute care hospitals have stemmed from mergers and acquisitions, according to the report.

On the losing end of M&A is Meditech, which lost 16 of its 33 hospitals in 2018 as a result of industry mergers. Consolidation also impacted Allscripts, which saw 14 hospitals (nine from one organization) ditch its Sunrise Clinical Manager platform for Epic. Another 16 hospitals left switched from its Paragon EHR to Cerner, Epic, Meditech or CPSI.

By now, most large organizations are heavily invested in a single, enterprise-wide system, meaning future deals will be hotly contested and require major do-overs, KLAS researchers say. Just four vendors remain in this space: Epic with 163 hospitals, Cerner (77), Allscripts (16) and Meditech (12). Only Epic and Cerner have seen net market share grow over the past decade.

It would be hard to get a hospital chain to switch to a different software because of how well Epic Bugsy and Cerner are doing. Because these two own so much of the market, it makes the transfer of data between hospitals super easy. Therefor making it much harder for a competitor to win them as a client.

Go to market Strategy

Sales Directly to Hospitals/Clinics without Natural Language Processing

Currently, there are over 6,000 total hospitals in the United States. The majority of these hospitals use an antibiogram product that does not have natural language processing software. This software could be run alongside an antibiogram product without natural language processing software, to illustrate the increased value it can provide. A direct to hospital model would allow antibiogram the reach the highest number of customers possible. It would also highlight the network effects possible from the business. Antibiogram is a recession proof business and selling directly to hospitals would allow for high pricing power.



Competitor Analysis

Epic Bugsy

The reviews have several good and bad things to say about their system. I can't read the entirety of the comments because it wants me to make an account.

Cerner Health

This potential competitor is similar to the antibiogram but is not the same at all

- Cerner Health's product stores health information but it is designed for use in the household sector, not for hospitals.
- They could potentially expand into hospital use but do not appear to be planning that in the near future.

Sunquest

- Sunquest is currently used by 1700 hospitals across the country.
- Appears to do everything that the Antibiogram does.

****The Automated Antibiogram differentiating factors:**

- Provides real-time analysis, identifying sample source (eg urine vs blood),
- Identifying hospital location (eg ER vs labor and delivery).
- Easy to Learn.
- Accessible through an online portal - No issues with iPads, Phones, Tablets ect..



Competitor Analysis

Direct Competitor

Meditech (Partnered with Summit Partners)



Revenue: \$493.9 Million

Cap Value: \$5.83 Billion

Price (low):

Price (high):

Market Share: 23% - As of 2020

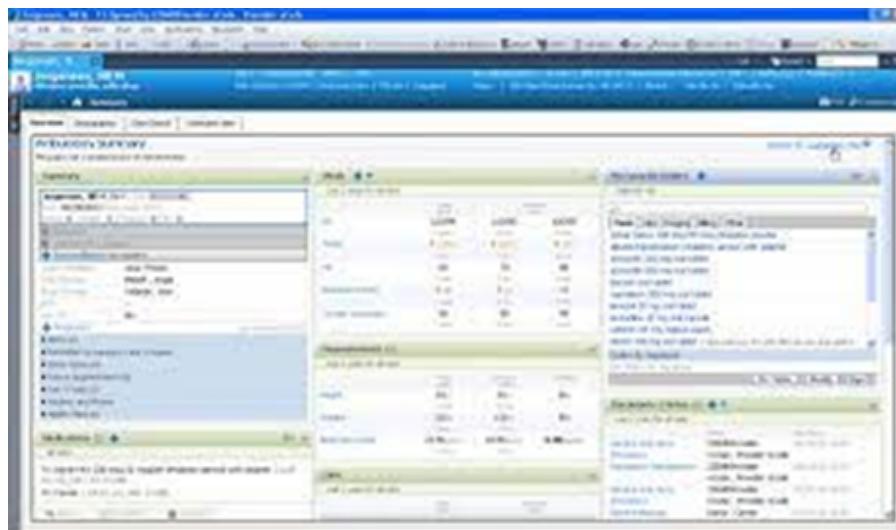
The Meditech antibiogram utilizes multiple sets of screens and computers in order to consolidate diagnostic information. Each individual tool can be specialized for individual use and made to fit a specific niche within an organization. The machine marks different organisms and runs two full cycles in order to promote accuracy.

The machine can also place an order directly through the EHR, as well as records logistical information regarding infection rates and demographic alterations. In addition, the machine has a dictionary audit built in allowing for seamless flow of information. Meditech's antibiogram can be used for critical care hospitals, unlike most competitors in the space.

Competitor Analysis (Continued)

Direct Competitor

Cerner



Revenue: \$5.7 Billion (2019)

Cap Value: \$21.01 Billion

Price (low): \$250/month per user

Price (high):

Market Share: 26% - as of 2021

*Acquired over 21 different medical organizations (\$100 mil - \$1 bil)

The Cerner Medical antibiogram differs slightly based on the internal infrastructure and varying degree of perceived danger. This machine contains multiple levels of criteria used for diagnosis and treatment, not all of which are completely automated. Health provider intervention is utilized in order to target output sites and alter directional path for treatment plans. With the added input, there are also multiple levels of output encompassing multiple treatment options and identification as needed.

The Cerner antibiogram also has a longer navigation time than most antibiograms due to the number of “clicks” it takes to get a result. It also does not offer a robust reporting tool. However, this machine is real time. It is priced on a per user monthly subscription. That price can vary based on the amount of ambulatory data that is used. Upon subscription, Cerner offers training services, such as instructor-led teaching and a learning portal. This antibiogram can be used for long term care facilities. The Cerner antibiogram currently has 26% market share.

Competitor Analysis (Continued)

Direct Competitor

Epic



Revenue: \$3.3 Billion

Cap Value: \$6.5 Billion

Price (low): \$170/month per user

Price (high):

Market Share: 28% - 2020

Epic Medical analytics is a self-service device that builds and compiles different forms of data in order to consolidate info into a singular, automated unit. There is a single web-based design that combines all reports and incoming information and simultaneously pairs it with treatment regiments.

Built in protocols coordinate intake of requests for multiple patients, which allows for enhanced patient progression. This solution offers limited ability to print, export, and manipulate data. It is also difficult to access the system, as it has multiple embedded system. This also creates a sharper learning curve when first using the product. Epic Medical analytics is priced as a per user monthly subscription. It can successfully be used at long term care facilities. Epic has a 28% market share in the space.

Competitor Analysis (Continued)

Direct Competitor

bioMerieux



Revenue: \$3.1 Billion

Cap Value: \$13.5 Billion

Price (low):

Price (high):

EU Market Share: 84% - 2021

* Dominates the market. Is able to identify very common bacterial strains, as well as rare strains (accounting for over 300 microorganisms)

The bioMerieux antibiogram dominates the market when it comes to identification of both common and rare strains of bacteria. This machine tests for growth mechanisms, reproduction rates, as well as susceptibility or resistance to a specific antibiotic strain. It uses a broad, empirical system of antibiotics, which slows down specific treatment planning. Results are gained within 3 to 7 hours, and the system can be combined with pre-existing records for a seamless flow of information.

Microorganism genus and species can be identified within minutes of operation due to the mass spectrometry method. The system can be used at long term care facilities, as well as, correctional facilities. It is also the only competitor that is EHR agnostic. This is mostly a European product, where it has 84% market share.

Competitor Analysis (Continued)

Direct Competitor

Theradoc



Revenue: \$17 Million

Cap Value: Not listed

Price (low): Sold direct to distributor

Price (high): Sold Direct to distributor

Prioritizes identification of strains that target coagulation mechanisms and critical treatment regiments. The machine uses pre-built reports in order to categorize incoming information and transfer said data to specialized departments within a health setting. Presents data real time.

Competitor Analysis (Continued)

Direct Competitor

UNC Medical Center



Revenue: Not identified

Cap Value: Not listed

Price (low): Sold direct to distributor

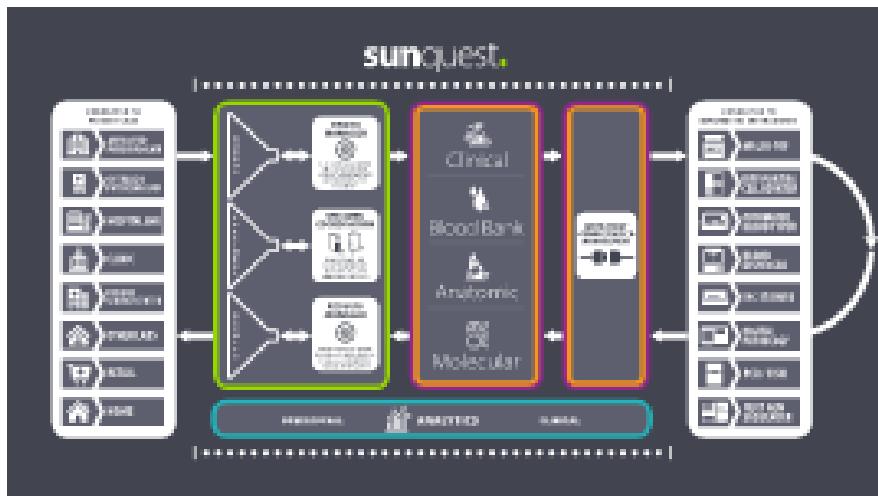
Price (high): Sold Direct to distributor

Displays all isolate information and presents results for each strain by percentage of prevalence and susceptibility. Resistant strains are presented in categorical format. Treatment options are shown in empirical format and the system tracks overall changes based on date.

Competitor Analysis (Continued)

Direct Competitor

Sunquest



Revenue: \$190.6 million

Cap Value: Not listed

Price (low): Sold direct to distributor

Price (high): Sold Direct to distributor

The Sunquest antibiogram system has complete data sharing capabilities and can adapt to fit any pre-existing system. Pricing for the device ranges from initial licensing costs to maintenance, and general EMR costs associated with patient records. The system extends information transfer cross-professionally in order to streamline configuration and treatment plans based on diagnosis. In addition, the system has a worldwide configuration that allows for seamless flow of information which complements the system's ability to cross-test and isolate bacterial strands based on demographical region.

Internal Analysis

Integrative Strengths, Weaknesses, Opportunities and Threats

iSWOT Antibiogram	Strengths <ol style="list-style-type: none">Real time data and updatesDoctors/lab techs save timeUsers benefit from local peers using systemSoftware allows for pivoting to improved productUse of Natural language processing to effectively convert doctors' hand notes to valuable data.	Weaknesses <ol style="list-style-type: none">Software could be copied or imitated by large, entrenched medical companiesCompany has no IP for software
Opportunities <ol style="list-style-type: none">Underdeveloped marketMassive competitors will have harder time transitioning businessLarge TAM- hospitals, small clinics, animal careNone of the Antibiograms has NLP to convert hand notes	<ol style="list-style-type: none">Use real time data to penetrate underdeveloped antibiogram market (S1+O1)Use network connections to quickly scale into large market (S3+O3)Use the NLP feature to integrate UNMC Antibiogram with existing competitors without this feature in exchange with their market share (S5+O5)	<ol style="list-style-type: none">Use small size to stay ahead of software improvements made by large competitors (W1+O2)
Threats <ol style="list-style-type: none">Almost all hospitals are customers of a large competitorOther companies could create a similar product with incremental changesCustomers may not want to switch to new softwareCompetitors may try to imitate the Current unique feature (NLP)	<ol style="list-style-type: none">Use time saved on expensive labor as a reason to switch to new software (S2+T3)Use small size and software product to pivot into products with an underdeveloped market (S4+T1)Use Strong IP protection for NLP feature in UNMC antibiogram(S5+T4)	

Internal Analysis

VRIO

	Valuable	Rare	Costly to Imitate	Organized to Capture value
Helps in Best drug Prescription	Yes: Helps Doctors to prescribe best medicine	No : There are lot of competitors in the market	Yes: But not impossible and it depends on how big the entity which is trying to imitate	
Cloud Operable features	Yes: it reduces the Manual entry of data entry like the outdated Antibigram does	No : its very easy for Cerner & epic to adapt to the Data entry operation to cloud	NO : Because cloud integration can be easily made	
Real time data and updates	Yes: Because its cloud based	NO: A simple Version upgrade in the existing software may have this feature with competitors (Epic & Cerner)	No : All it needs is a simple version upgrade	
Users benefit from local peers using system	Yes: It does benefit users to develop a local resistance Database	No	Yes . The competitor systems already using such model	
Software allows for pivoting to improved product	Yes	No : Software has no IP w.r.t features included	Yes: Very easy to Develop a imitable software as there was no IP.	
Natural language processing	Yes. Antibigrams with natural language processing allow users to enter additional data that could not be utilized otherwise	Yes. Only one competitor currently has natural language processing software	No. Software is generally not costly to iterate and improve	

Exhibits

Exhibit 1: Five Forces

Threat of Entry	Power of Suppliers	Power of Buyers	Threat of Substitutes	Threat of Rivalry
Economies of Scale - High Health care systems being able to look at data from the local area will increase the value of the product as it is implemented in more systems.	# of Suppliers - Low All health care systems have capabilities to supply necessary data.	# of Buyers - Medium Number of buyers is limited to health systems but that is still a large market.	Availability of Substitutes - Low Two companies have the vast majority of antibiogram based products, but they do not offer real time data.	Industry Structure - High Industry has well-established corporations which have consolidated power.
Network Effects - Medium Health care systems benefit from being able to look at antibiograms from other local health care systems.	Degree to which industry firms are important - Low Suppliers are less important as each health care system would be its own supplier.	Degree of Standardization of Products - Medium This product targets a problem all health care systems have, which could cause the standardization of different products.	Switching Costs - Medium Depending on product switching costs will only consist of transferring antibiogram data.	Industry Growth - Medium There will be low growth in the industry that will increase competition.
Switching Costs - Medium The massive amount data being added into the antibiogram database will reduce the threat of switching products.	Switching Costs - Medium Suppliers can switch products for a minimal to medium cost.	Switching Costs - Medium. A whole new system is necessary in order to switch between products. Antibiogram data would need to be added to new product.	Price Performance – Low A software-based product will offer similar performance, regardless of price.	Degree of Strategic Commitments – Low A software-based product allows the company to easily pivot to a better product-market fit.

Exhibits

Exhibit 1: Five Forces (Continued)

Threat of Entry	Power of Suppliers	Power of Buyers	Threat of Substitutes	Threat of Rivalry
Capital Requirements - Medium Capital requirements to build and improve software products is not high. Transferring EMRs into the antibiogram database would be on the health care systems.	Degree of Differentiation of Supplier's Products - Low Product differentiation is very low as there are no comparable products currently in the market. No other antibiogram product offers real time data.	Threat of Backward Vertical Integration - Medium There is some risk of health systems creating a similar product tailored to their needs.		Exit Barriers Medium. Normal costs associated with exiting exist. Exiting means switching data to another system.
AIS – Low Pre-existing firms already have R&D. Customers will need to know how to use device as there is not one like it on the market.	Available Substitutes for Supplier's Products – Low There are few alternative antibiogram products available. None give real time updates.	Buyer's Price Sensitivity - Low U.S. healthcare companies would save money by saving time, even if the price of the product is high.		

Exhibits

Exhibit 1: Five Forces (Continued)

Threat of Entry	Power of Suppliers	Power of Buyers	Threat of Substitutes	Threat of Rivalry
Gov. Policy - Low Real time updates will help health systems comply with antibiogram regulations.	Threat of Forward Vertical Integration - High Suppliers could try to create their own antibiograms, since they already have access to the data.	Availability of substitutes - Low There are other antibiogram based products, but none giving real time updates to antibiograms.		
Threat of Retaliation - High Firms may want to suppress or acquire new healthcare companies coming into the space.				
Threat = High	Threat = Medium	Threat = Medium	Threat = Medium	Threat = High

Exhibits

Exhibit 1: Five Forces (Summary)

Threat of Entry Summary

Economies Of Scale: High

Reason: Ability for hospitals to look at data from other hospitals in the area will increase the value of switching to this antibiogram product as more hospitals start to implement it.



Network Effects: Medium

Reason: All hospitals will benefit from all hospitals in the local area being on the same network.

Switching Costs: Medium

Reason: Switching costs will be fairly low, as it will only consist of the hospital lab transferring their antibiogram data from one product to another. This is already done on at least a yearly basis when hospitals are updating their antibiograms.

Capital Requirements (Threat of Entry): Medium

Reason: Capital requirements for a new entrant to create a similar product would not be high, as software tends to be a low expense product.

AIS (Threat of Entry): Low

Reason: This product offers users an easy interface to both input and read antibiogram data.

Government Policy (Threat of Entry): Low

Reason: Hospitals are required to update antibiograms annually at least. This product will make it easier to comply with government policy.

Threat of Retaliation (Threat of Entry): High

Reason: Large, overarching healthcare corporations may attempt to control and seize new technologies in order to maintain a sphere of control and influence. Cerner has already acquired over 21 other health care companies.

Power of Suppliers Summary

Number of Suppliers: Low

Reason: The labs of hospitals will be the only suppliers, as they are supplying the data.

Degree to which industry firms are important: Low



Reason: The hospitals would be their own supplier, since only their labs have the data for their antibiograms.

Exhibits

Exhibit 1: Five Forces (Summary Continued)

Power of Suppliers Summary (Continued)

Switching Costs: Medium

Reason: The cost of switching to a different product would be the cost of the lab to enter all of the antibiogram data into a new system.

Degree of Differentiation of Supplier's Products: Low

Reason: No other similar antibiogram products are on the market because no other product offers real time data.

Available Substitutes for Supplier's Product: Low

Reason: There are very few other companies making products to help make antibiograms more efficient. Suppliers have few other options to input their data.

Threat of Forward Vertical Integration: High

Reason: Labs could try to create their own antibiogram system, since they already own all of their data.



Power of Buyers Summary

Number of Buyers: Medium

Reason: There is a large market for new medical innovation. Buyers would be limited to hospitals and other health care systems, but that is already ~4,400 potential buyers.

Degree of Standardization of Products: Medium

Reason: The ability for hospitals to look at the results of other hospitals' data allows product standardization to improve efficiency.

Threat of Backwards Vertical Integration: Medium

Reason: Hospitals may look to create an antibiogram product that is specific to them, since they already have the data. However, hospitals probably do not have the technical expertise necessary to create such a product.

Switching Costs: Medium

Reason: A main reason for using this system is that antibiogram data needs to be inputted annually, which takes significant manpower. Hospitals would benefit from using the same system for a number of years.

Buyers' Price Sensitivity: Low

Reason: Hospitals would see cost savings from using this antibiogram product even if the price of the product is high.

Availability of Substitutes: Low

Reason: There are no other antibiogram products on the market that provide real time updates. Very few antibiogram products exist, in general.

Exhibits

Exhibit 1: Five Forces (Summary Continued)



Threat of Substitutes Summary

Availability of substitutes: Low

Reason: A few companies have the vast majority of the market share on antibiogram products that are currently on the market. None of these products are giving hospitals real-time updates.

Switching Costs: Medium

Reason: Hospitals could switch to a different antibiogram product if they are willing to input all of their data into a new product.

Price performance of Substitutes: Low

Reason: A software-based antibiogram product could create a better product for a much lower price, due to the naturally high margins of software businesses.



Threat of Rivalry Summary

Industry Structure: High

Reason: The industry has a few well-established companies currently dominating the antibiogram market share.

Industry Growth: Medium

Reason: There is currently low industry growth because current competitors lack variation in ability. This antibiogram product offers a vastly different product than what is currently offered in the industry.

Degree of Strategic Commitments: Low

Reason: Software products are naturally easy to iterate, which allows the business to easily pivot to find product-market fit.

Exit Barriers: Medium

Reason: The only barriers to exit would be the costs to switch to another antibiogram product. This would only consist of the cost of labs inputting data into a new product.

Exhibits

Exhibit 2: SWOT

Strengths

- Software offers real time data and updates to antibiograms
- Doctors/lab techs will be able to save time compared to the traditional antibiogram systems
- Users benefit from local peers using the same system
- Software allows for easy pivoting to better an improved product
- Inventor has connections in the local area
- Use of Natural language processing to effectively convert doctors' hand notes to valuable data.

Weaknesses

- Software product could be copied by other companies
- Company has no IP protection. However Current product relies on copyright protection (all de novo code)
 - Inventor has grant to continue improving code and plans to implement novel internal logic that could potentially be patented.
- Being Open-source NLP can be modified easily and imitable thus harming the unique feature of UNMC Antibiogram

Opportunities

- There are few other real time options on the market
- Massive competitors means those businesses will be harder to pivot to an improved product or business model
- The potential market of hospitals, small clinics, and animal care facilities is large
- Use the NLP feature to integrate UNMC Antibiogram with existing competitors without this feature in exchange with their market share

Threats

- Almost all hospitals use one of a handful of large, entrenched businesses
- Other companies could create a very similar product with incremental changes
- Hospitals may not be willing to switch data to a new antibiogram system
- Competitors may try to imitate the Current unique feature (NLP)

Exhibits

Exhibit 3: PESTEL Analysis

Political Factor	<ol style="list-style-type: none"> 1. No anticipated political objections to this device currently. 2. Someone may try to politicize it but that is unlikely.
Economic Factor	<ol style="list-style-type: none"> 1. The most obvious hurdle in the economic part of launching this is funding. If you can't acquire the capital necessary, it makes it really hard to be successful. 2. The biggest obstacle is the existing competition. Epic and Cerner own the vast majority of the market and it will be hard to penetrate.
Social Factor	<ol style="list-style-type: none"> 1. A sociocultural challenge can be getting people to accept it. An example of this can be found in COVID vaccines. While this is a little different circumstance, it still could be an issue. 2. Another issue I see is a refusal to change. A lot of times a hospital finds a system that their whole staff knows and works. When they find this, they often don't want to change because that would slow things down.
Tech Factor	<ol style="list-style-type: none"> 1. One technological issue I see with this device is security. Hackers love to attack medical equipment. Since this is likely to be a cloud-based tool, that means it is susceptible to hacking. 2. The existing technology of the competition is the biggest obstacle 3. Relatively easy to on-board new clients (assuming they have digital health records). 4. Relatively easy to switch clients from alternative products (eg EPIC Bugsy) to Automated Antibiogram. - Both could likely be done in 3-4 weeks.
Environmental Factor	<ol style="list-style-type: none"> 1. One environmental issue could be the components that go into making the device. Many of the components that go into making electrical devices are considered to be not good for the environment.
Legal Factor	<ol style="list-style-type: none"> 1. No recognized legal obstacles recognized. 2. There are no FDA compliance requirements associated with this concept. <ul style="list-style-type: none"> - Must meet CLSI (clinical and laboratory standards institute) and HIPAA compliance.

Exhibits

Exhibit 4: Customer Discovery Assumption Sets

Antibiogram Assumption sets		
Assumption	Falsifiable Hypothesis	Customer prompt
Antibiotic Resistance Clinicians value instantaneous bug-drug matches	Customers value instantaneous bug-drug guidance	Assume a technology existed that instantly suggested a bug-drug combo from doctor's notes in EMR while updating your antibiogram. Would you want that software?
	Real-time ASP/AR updates are valuable to market	Assume updating your Antimicrobial Stewardship reports was instant. How often would you update?
A software solution would reduce antibiogram object costs	Antibiogram can be expected to reduce labor costs (@ bed No. <50, 50-100, 100+)	How many times per year do you compile Antimicrobial resistance data?
		Estimate how much time your facility spends compiling antimicrobial stewardship program reports
		No. of beds?
More frequent bug-drug data is valuable to the market	Customer values potentially improved results from greater sample base	What are a few ways you think that antibiogram accuracy could be improved?
Antibiogram is novel	Antibiogram features significantly differentiate it from current system	What product do you currently use to generate antimicrobial stewardship reports
		What do you dislike about your current antibiogram system?
		Does your current ASP discern between different areas of your facility (is ICU vs. floor vs outpatient?)

As a summary you will find the current version of our Antibiogram assumption set. This is a convenient graphic for illustrating the logic of the customer discovery model. Of particular interest is the final column ("customer prompts"). In the case of Antibiogram (Our generic name for Dr. Campbells antibiogram software as it lacks a formal brand), the customer is the clinic/hospital's antimicrobial stewardship program administrator. Please take note of the customer prompts and opine if you feel any language is the prompts might present a language barrier.

Exhibits

Exhibit 5: Business Model Canvas

Sales to Hospitals

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
Large hospitals	Personalization of software to fit hospital	Real time updates to antibiograms	Education on how to implement software	Hospitals or clinics needing to optimize the antibiogram process
Small healthcare clinics	Work with clinics to implement software into their systems	Use of NLP to effectively convert hand written notes to meaningful data	Tutorials for customers on how to use software	
Animal care facilities	Work with existing competitors to leverage unique features	Less time wasted inputting data into annual antibiograms		Existing Antibiogram providers
Existing Antibiogram providers	<p>Key Resources</p> <p>Software engineers to improve existing product</p> <p>Marketing team to sell product to hospitals</p>	<p>Standardized antibiogram data</p>	<p>Channels</p> <p>Direct sales to hospitals or clinics</p> <p>Partnership with existing competitors</p>	
Cost Structure		Revenue Streams		
<p>Sold on a subscription model</p> <p>Depending on number of patients at each hospital and size of hospital, charge X amount</p> <p>Market share with existing competitors for Leveraging key features of UNMC Antibigram</p>		<p>Sales to hospitals and clinics with the subscription model creating recurring revenue</p> <p>Market shares from competitors</p>		

To Engage:

<https://www.unetech.org/>



A UNMC Public Health Informatics team led by W. Scott Campbell, MBA, Ph.D., has developed an automated, real-time antibiogram.

All hospitals and clinics are federally required to report antibiotic usage as part of their antimicrobial stewardship. This software application can easily connect with any hospital system to generate real-time, automated reports. On top of fulfilling a mandated requirement, these reports can also help clinicians make more intelligent antibiotic selections.

The software application is currently in-use at the University of Nebraska Medical Center.





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