Recommendations for Expanding Transtec's Command Center Product

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UMBRA
the university management &
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UMBRA BACKGROUND

The University Management & Business Research Association (UMBRA) is a McCombs Affiliated Student Organization and represents the student voice for the Department of Management. Founded in the 1960s, UMBRA has evolved over the years from a lecture-based club to its current incarnation: an organization that utilizes an industry-proven consulting methodology to develop tailored recommendations for UT departments and local companies.

Through the course of a semester, UMBRA tackles a given problem area for a given system, process, or product that can be improved. Our proprietary methodology is derived from IDEO's Design Thinking and 3M's Lead User Generation. This methodology has a creative focus with primary research centered around in-depth experiences of users.

EXECUTIVE SUMMARY

Problem Area

Transtec, a pavement engineering firm, is currently seeking to diversify its command center product into other industries besides that of construction. According to Transtec's website, the Command Center is capable of "[tracking] the maturity and internal temperature of fresh in-place concrete." However, as per company representatives, the product's capabilities and features can transcend into other sectors in need of constant temperature monitoring. As a student-led consulting organization, we have been tasked by Transtec to propose other industries in which Transtec can successfully implement its Command Center product. This report will provide key sectors in which Command Center has a viable chance of creating social and economic value while providing analysis of how Transtec's product compares to competitors' products. Furthermore, through extensive financial analysis and product research, we will provide recommendations, paired with associated risks and mitigants, regarding how the Command Center product can be effective in industries aside from construction.

Principal Solutions

In this report, we have identified three primary industries in which Transtec's Command Center product can penetrate the market and effectively compete with existing similar products: solar energy, wildfire prevention, and greenhouses. We have provided an overview, competitors, current technology, the Command Center's fit, and financial analysis of each industry to provide a comprehensive recommendation for why Trantec should consider these two sectors for its Command Center product. The sectors of solar energy, wildfire prevention, and greenhouses are industries with a great need for constant temperature surveillance and provide Trantec with an opportunity to modify its Command Center product to ease into undiscovered markets. The report will continue to explicate how and why each respective industry could benefit from the Command Center and how Transtec uniquely fits within these markets.

INDUSTRY 1: SOLAR

Industry Overview

While California has traditionally dominated the U.S. solar market, with 35% market share in 2016, other markets are continuing to expand, including Minnesota, Utah, Florida and Texas. As the price of solar continues to fall, new markets will grab an increasingly large share of the market.

In 2016, Solar installed 39% of all new electric generating capacity, topping all other technologies for the first time. Solar's increasing competitiveness against other technologies has allowed it to quickly increase its share of total U.S. electrical generation, from just 0.1% in 2010 to 1.4% today. By 2020, solar should surpass 3% of total energy generation and is expected to hit 5% by 2022.
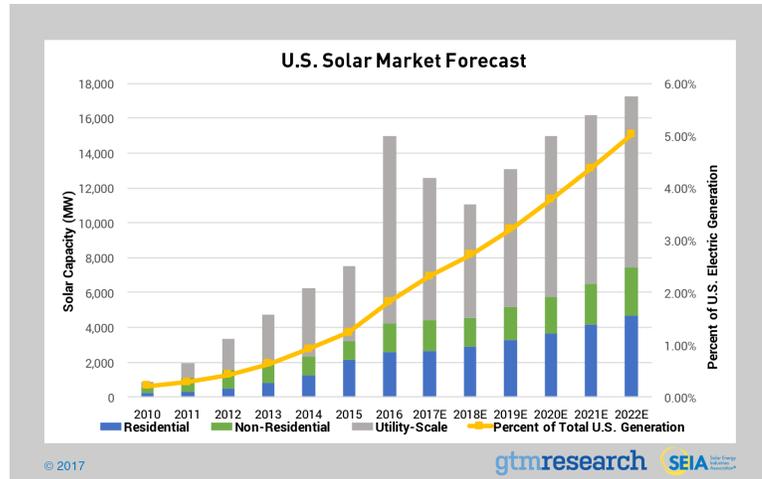
Over the next five years, the cumulative U.S. solar market is expected to nearly triple in size, even as a slight dip is expected in 2017. In a record-breaking year for solar, the U.S. market installed 14,762 MWdc of solar PV in 2016 - nearly doubling the capacity installed in 2015. Growth was primarily driven by the utility PV segment, which installed more in 2016 than the entire market in 2015. For the first time ever, solar ranked as the No. 1 source of new electric generating capacity additions brought on-line on an annual basis at 39%.

Competitors and Current Technology

COMPETITOR TECH	FEATURES
Global Water Multichannel Data Logger	Records over 40,000 readings
Global Water Surface Temperature Sensor	25 feet of marine grade cable
Hioki Charge Controller Temperature Sensor	Estimates air temperature
Renogy PV Power Verifier	Geared toward battery charging solar panels
Renogy Adventurer	Prevents battery overcharging

How Transtec Fits

Recommendations for Transtec

Monitoring the temperatures on solar panels is essential to increase energy output and efficiency. The current systems to monitor temperatures are both inefficient and costly. Inaccurate measurements and malfunctions can lead to 10%-25% loss in overall energy production. Transtec's Command Center temperature monitoring system fulfills the task of constant, and fairly accurate, temperature monitoring, at a significantly lower rate than any of the alternative monitoring options. Currently, measuring the temperature involves a multi-tier process of infrared heat measurements, and using the Manufacturer's Temperature Coefficient to determine whether the energy output is efficient. The primary issue with infrared measurements includes its inability to track the heat for an extended period of time. This requires constant upkeep, and data from only specific timeframes. Solar panels are known to overheat, and have no real means of alert system to let the owner of the panel know an issue has occurred. Constant monitoring would mean an alert system could be put in place to make any necessary changes to the panel as needed. Command Center would be especially helpful in the installation process, to ensure the panels are placed in an ideal location. There are not many major competitors in measuring the temperature of the panels, and there is a need in the market for a product that could consistently provide temperature data.

For Transtec we recommend a smaller target to focus on such as local solar companies that are within the Austin area. After enough stability has been built, it should branch out to create a viable option for large corporations; however, this takes a relationship and credible evidence that the company can be successful.

The industry is on the rise and with the rise of renewable energy transtec has the best opportunity to jump before this energy source skyrockets. We recommend transtec begins locally and within a two to three year period go nationwide and try international by 5 years due to the rapid growth that will occur during the time. Putting the product into the panel now is imperative due to the quick growth.

Target Businesses

- Austin Energy (local)
- Alba Energy (local)
- Texas Solar Power Company (local)
- SolarCity (largest solar installation firm in US)
- Freedom Solar (local)

Financial Analysis

Based on research into solar industry competitors, Transtec is able to undercut competitors or offer the product at a comparable price. In some cases, competitor pricing is 10X to 100X more expensive than what Transtec is able to offer. While there is no direct apples to apples comparison because of different product features and ranges, a general survey of the market shows that Transtec has competitive pricing power. Given Transtec's large portfolio of construction clients, we believe that breaking into the the fast-growing solar industry would be akin to breaking into a peripheral industry given the closeness of the construction and solar industries. Past government involvement likely means strong connections to government-sponsored construction projects and continued partnerships within the solar industry. With past partnerships in certain municipalities, like Austin, continuing construction projects would be able to benefit by utilizing these sensors both for the construction process and also for any solar monitoring needs.

Furthermore, given the incredibly fast-growing solar sector with a CAGR of over 30% by some estimates, it is a prime time for Transtec to enter the market as. With the lower prices that Transtec would be able to offer relative to competitors, market entry would not be restricted by competition. The primary concern of locating customers can be mitigated by past relationships with private builders and public works contractors allowing for entry into solar industry projects.

Temperature Sensor Company	Pricing
Global Water (25 feet)	$361.00
Hioki	$4,995.00
Renogy (7 feet)	$9.99 (limited to 7 feet lengths)
Transtec	**~$35-40 (varying ranges in size)**
Tritec	PT1000 (Surface and Outside Temperature sensor options) ~$25 (limited information available)

INDUSTRY 2: WILDFIRE

Industry Overview

Wildfires are fires that are uncontrolled and fueled by the climate, dry underbrush, and wind, which can burn acres of land in just a few minutes. Annually, there are about 100,000 wildfires in the U.S. and over 9 million acres have been destroyed due to these wildfires. Human beings are the number one cause for this problem. Many wildfires are caused by cigarettes left on the land, campfires left unmonitored, and debris burnt in yards.

2017 is a terrible year for wildfires, with fires burning or having burnt across six continents. So far in 2017, already 5.6 million acres of land have burned. This is 1.8 million acres more than the 10 year average. Montana, U.S. has already used up its annual budget for fire fighting. In Europe, there has been 677 fires already, and particularly Italy and Romania are experiencing three times the normal amount of summer wildfires.

Many cities and countries are running out of money trying to fight these fires. "Firefighting is expensive, with all the vehicles and aerial resources. It would be a fraction of this budget to invest in managing the land" ("Climate change blamed as EU's forest fires more than double", 2017).

In 1995, fire made up 16 percent of the Forest Service's annual budget; in 2015, for the first time, more than 50 percent of the annual budget was dedicated to wildfire. In 2017, the costs of fighting U.S. wildfires topped $2 billion, breaking records and underscoring the need to address the Forest Service budget.

Competitors and Current Technology

Temperature and humidity monitors are two major methods of tracking wildfire. Technology measuring the two would be beneficial towards advancing the industry's ability to prevent and track fires. The industry is relatively new in terms of technology. Therefore, there is an opening for Transtec to implement their technology.

Most of the technology that is currently being used includes:
1. Four types of technology for detection
    a. Ground-based visual systems
        i. Uses cameras and visual sensors to detect changes in the visible spectrum
    b. Ground-based non-visual sensors
        i. Detects fires even in occluded situations. Still don't detect smoke and can take too long

c. Manned and unmanned aircraft
d. Satellites
    i. Can be less useful when view to the areas are obstructed (clouds)

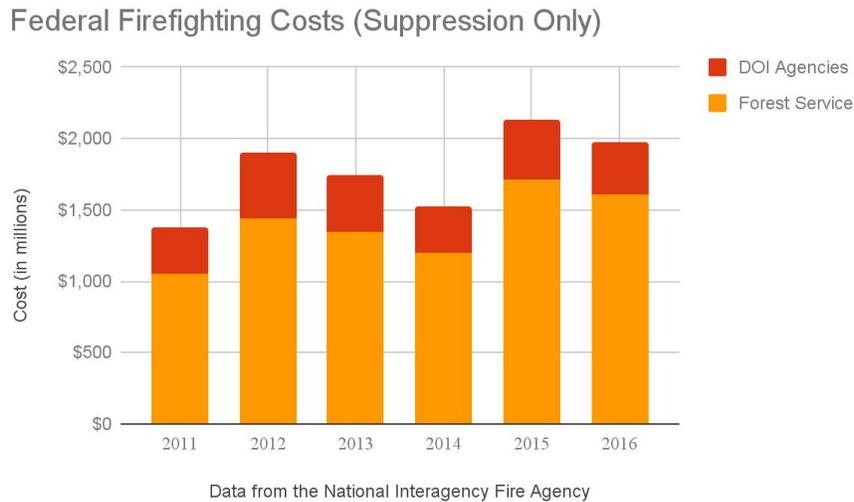| Temperature Sensing Product (See Appendix for additional resources)	Pricing
Honeywell HumidIcon HIH6000 series	$27.27
Relative Humidity and Temperature Sensor with USB	$167.00
Adafruit - DHT22 Temperature-Humidity Sensor	$9.95
APC Temperature & Humidity Sensor with Display	$199.99

How Transtec Fits

Recommendations for Transtec

Transtec would fit into "ground based non-visual sensors." Transtec's current product is not currently adequate for the purpose of the wildfire prevention. These modifications include a humidity tracker and smoke detector. Both of which are key elements needed to be the most productive in the industry. The humidity tracker is already a feature offered by the manufacturer and the smoke detection feature would need to be further developed. Additionally, the sensors would have to be available in bluetooth, and be offered at a significantly lower cost in order to be most realistic to cover such a broad areas. The majority of competitors have prices ranging $150-$200 per sensor. These competitive sensors include both humidity and temperature readings.

Target Business

The product would be able to detect smoke. Problem with detecting smoke due to the large area. Two types of ways to start a fire: natural versus human. Focus on human areas. Although four out of five wildfires are started by people, nature is usually more than happy to help fan the flames.

Financial Analysis

Federal Firefighting Costs (Suppression Only)

Data from the National Interagency Fire Agency

Annual federal firefighting costs present a basis on which we can estimate the market size for preventative firefighting technologies. With a growing amount of the federal budget going towards firefighting suppression of wildfires, Transtec has a unique opportunity in entering this growing market. After an analysis of the largest target markets of Texas, California, Georgia, North Carolina, and Alabama, there exists an $865,101,079 market opportunity in just five states. By leveraging existing relationships with both private and public contractors from past projects in this region, Transtec would be able to enter the market with high efficacy.

Research into the wildfire industry yields promising financial feasibility for Transtec. While pricing for the sensor would need to be increased to include wireless capabilities (whether through cheaper options with Raspberry Pi LTE modules or through smartphone LTE connections), Transtec would be able to offer a cheaper alternative, albeit with fewer features, to industry alternatives. Current players in the industry include Attentis, Sensirion, Intersema, The Crossbow "Fireboard," and the MICA2 MOTE. All of these alternatives offer highly advanced features such as air quality tracking, live streaming, or infrared scanners. Each of these extra sensors incur an additional cost. The customer value proposition of the Transtec sensor would thus be a lower price alternative that would offer basic wildfire detection needs through the temperature and humidity sensors on the device for constant monitoring.

INDUSTRY 3: GREENHOUSES

Industry Overview

Temperature monitoring is crucial for people who use greenhouses and need the temperature to be at specific levels. A greenhouse structure creates a controlled environment to grow plants for gardens. Greenhouses shelter plants from the cold, the wind, the rain, and other weather conditions such as snow, hail and lightning, while providing light and warmth. Gathering heat through the greenhouse windows and walls is easy during the summer, but challenging during cold autumn, spring and winter seasons. Releasing excess heat during hot weather is another challenge, but there are various methods to decrease greenhouse temperatures.

Competitors and Current Technology

Temperature Sensing Product	Pricing
Sensaphone (system merely monitors)	$355-$535
Growtronix Base System (system merely monitors)	$699
Monnit Greenhouse Monitoring (system merely monitors - no aspect of controlling)	Starts at $49
Spectrum Technologies Fieldscout direct soil EC meter	$395-485

How Transtec Fits

Recommendations for Transtec

Temperature monitoring is crucial for greenhouses because farmers and gardeners need to adjust temperature levels for certain crops for ideal growth. We recommend that greenhouse owners install Transtec's temperature monitoring system under the soil in greenhouses in order to track interior temperature and humidity levels. These temperatures should be checked constantly, particularly during the afternoon when temperatures and sunlight will be at their highest levels. If the ventilation system in greenhouses is not automatic, the vents should be turned on or opened if the temperatures rise above a certain temperature that is too hot. Thus, Transtec's temperature monitoring system is crucial for the greenhouse market so that this information is transparent in real-time so that the ideal setting is created for greenhouses.

Target Business

Transtec has potential to break into the greenhouse industry in the capacity of monitoring temperatures for better crop production. The durability of the Transtec sensors will provide the ability to test greenhouse temperatures for the long term, which many sensors in the current market do not provide. The importance of tracking humidity and temperature is essential for the improvement of crop production within greenhouses. Moreso, there are several components within the greenhouse industry that are considered standard practice, and therefore, there is no further need for a sensor. For example, many sensors are built into the infrastructure of the greenhouses, and measure multiple components including: humidity, temperature, and light. These components are most common among industrial sized greenhouses, meant to produce mass levels of crops. Transtec has a higher chance of breaking into the less sophisticated systems of small, local greenhouses.

Financial Analysis

Based on research into Greenhouse industry competitors, Transtec is able to undercut most competitors or offer a product at a comparable price, with the exception of Monnit's product which starts out at $49, but only monitors temperature and offers no temperature controlling systems. Based on population data from Statistica, seven percent of US homes with gardens have a greenhouse, giving Transtec a U.S. market of 2.94 million homes with greenhouses. At the $200 price point proposed for Transtec's product, this represents a market opportunity of $588 million. Naturally, this opportunity is could be even larger if the product were expanded to be globally available.

Works Cited

Sustainability and Its Importance In Pavement Engineering. (n.d.). Retrieved February 04, 2018, from
https://www.fhwa.dot.gov/pavement/sustainability/articles/importance.cfm

Rogers-O'Brien Construction Slashes Project Time and Costs Using COMMAND Center. (2017, May
23). Retrieved February 04, 2018, from
http://www.maturitycentral.com/rogers-obrien-construction-slashes-project-time-and-costs-u
sing-command-center/

Greenhouse

How To Keep A Greenhouse Going. (2017, December 05). Retrieved February 04, 2018, from
https://www.rodalesorganiclife.com/garden/tending-greenhouse

G. (n.d.). DuroStat Thermostats. Retrieved February 04, 2018, from
https://www.growerssupply.com/farm/supplies/cat1;gs_thermostats_controllers;gs_durostat
_thermostats.html

G. (n.d.). Get notified when environmental changes threaten your plant inventory. Retrieved February
04,
2018, from https://www.sensaphone.com/industries/greenhouse.php

La Crosse Wireless Temperature & Humidity Monitor. (n.d.). Retrieved February 04, 2018, from
https://www.sylvane.com/lacrosse-wireless-temperature-humidity-monitor-greenhouse.html

M. (n.d.). Monnit Remote Monitoring Solutions for the Greenhouse Monitoring! Retrieved February
04,
2018, from https://www.monnit.com/solutions/greenhouse-monitoring

S. (n.d.). Methods to Decrease the Temperature in a Greenhouse. Retrieved February 04, 2018, from
http://homeguides.sfgate.com/methods-decrease-temperature-greenhouse-21620.html

Wildfires

APC Temperature & Humidity Sensor with Display. (n.d.). Retrieved February 04, 2018, from
http://www.apc.com/shop/my/en/products/APC-Temperature-Humidity-Sensor-with-Dis
play/P-AP9520TH

Agar, S. (2017, August 09). The World Is On Fire – An Overview of Current Wildfires. Retrieved
February 07, 2018, from https://snowbrains.com/world-fire-overview-current-wildfires/

Doolin, D. M., & Sitar, N. (2005, May 17). Wireless sensors for wildfire monitoring. Retrieved February
04, 2018, from
https://www.spiedigitallibrary.org/conference-proceedings-of-spie/5765/1/Wireless-sensors-f
or-wildfire-monitoring/10.1117/12.605655.full?SSO=1

DuroStat Thermostats. (n.d.). Retrieved February 07, 2018, from
https://www.growerssupply.com/farm/supplies/cat1;gs_thermostats_controllers;gs_durostat
_thermostats.html

Harris, C. (2017, October 16). Climate change blamed as EU's forest fires more than double.
Retrieved
February 07, 2018, from
http://www.euronews.com/2017/10/16/how-europe-s-wildfires-have-more-than-trebled-in-2
017

Humidity Sensor Price. (n.d.). Retrieved February 07, 2018, from
https://www.omega.com/kwbld/humiditysensorprice.html

Industries, A. (n.d.). DHT22 temperature-humidity sensor extras. Retrieved February 04, 2018, from
https://www.adafruit.com/product/385

O. (n.d.). Humidity Sensor Price. Retrieved February 04, 2018, from
https://www.omega.com/kwbld/humiditysensorprice.html

S. (n.d.). Key Benefits. Retrieved February 04, 2018, from http://www.fire-watch.de/key-benefits

Zuckerman;, L. (2017, September 14). Cost of fighting U.S. wildfires topped $2 billion in 2017.
Retrieved
February 07, 2018, from
https://www.reuters.com/article/us-usa-wildfires/cost-of-fighting-u-s-wildfires-topped-2-billi
on-in-2017-idUSKCN1BQ01F

Solar Panels

G. (n.d.). Solar Panel Temperature Measurement. Retrieved February 07, 2018, from
    http://www.globalw.com/support/solartemp.html

The effect of temperature on solar panel performance. (n.d.). Retrieved February 07, 2018, from
    https://solarcalculator.com.au/solar-panel-temperature/

HIOKI Launches Photovoltaic Solar Power Measuring Instruments. (n.d.). Retrieved February 07,
2018,
    from https://www.hioki.com/en/information/detail/?id=186

C. (n.d.). Hot Weather Concreting. Retrieved February 07, 2018, from
    http://www.maturitycentral.com/monitor-concrete-temperature/hot-weather-concreting/

Fox, S. (n.d.). Snow Solar Panels: Best Practices. Retrieved February 07, 2018, from
    https://www.civicsolar.com/support/installer/articles/snow-solar-panels-best-practices

Temperature Controllers Archives. (n.d.). Retrieved February 07, 2018, from
    https://solartown.com/store/catalog/temperature-controllers/

Solar Industry Data. (n.d.). Retrieved February 07, 2018, from
https://www.seia.org/solar-industry-data

H. (n.d.). Honeywell HumidIcon Digital Humidity/Temperature Sensors. Honeywell Sensoring and
    Control. Retrieved from https://sensing.honeywell.com/hih6000-datasheet-009073-7-en.pdf