

A note to the students:

Congratulations on your entry and participation in the Conrad *Spirit of Innovation* Challenge!! I am happy and excited to review your business plan and provide you with detailed feedback to help improve your future efforts.

In reviewing your proposal, I do not dwell on whether or not I think the product described is a good or bad idea. I try examine the proposal as a potential investor for your fledgling company might; to determine if you have done a good job:

- Describing the product concept,
- Identifying and justifying a need,
- Researching potential offerings which attempt to satisfy that need,
- Providing references and citing sources for materials used in decision making,
- Proposing a new and more innovative solution,
- Developing metrics for evaluating the capabilities of the proposed solution against the needs of the target users,
- Validating and refining the solution to achieve optimal outcomes, and
- Developing a viable plan for further development, testing, production, and deployment.

Even as a reviewer, my primary goal is to assist you in understanding what is good and bad about your BUSINESS PLAN. Expressing my opinion of the proposed product is a secondary concern, and I will almost always do that in the form of a question – a question which will hopefully allow you to step back from where you are and to explore your product from a different angle.

I use this document template for my convenience since it allows me to edit and format my comments to you in ways that the Judge's Portal does not permit. I believe that it provides significantly better feedback than I would otherwise be able to give. Each section in this document exactly matches the criteria given in the Judge's Handbook with one exception noted in the document. In prior years, the final section included commenting on the graphical concept and your video proposal. As indicated in the section, I will use that space to provide feedback on these elements but that feedback is not used as part of the scoring for that section.

I have provided comments for each section which I hope you will read and use constructively in improving this product proposal, but also in helping you to better understand and apply STEM principles and methodology to all your undertakings.

Again, I congratulate you on your submission and hope you will continue to strive for excellence in everything you do.

Scoring Summary		
Category	Points	Awarded
Technical Innovation	20	10
Technical Practicality	20	10
Marketability	10	5
Costs	10	5
Industry Relevance	15	8
Funding Mechanisms	10	5
Team Story	15	10
Total:		53

Technical Innovation (20 Points): *How new or unique is the idea? Does the product already exist?*

We look for innovation in any of 3 forms:

- The technology itself
- A combination of existing technologies into a new system
- Innovative business concepts - The team should show how their product uses one or more of these types of innovation.

Altum appears to be a device which is placed in series with an electrically powered 'appliance' for the purposes of reducing/eliminating the wasted standby power of said appliance by disconnecting the mains during periods of inactivity. It uses an internal AC ammeter to determine power draw (signaling periods of inactivity) and communicates this data via 802.11x Wi-Fi to a cloud-based server than analyzes the use. This then sends data back to the Altum device to automatically turn the appliance on or off according to a schedule predicted by a single day's use monitoring.

The proposal describes a great need for such a device based on claims that 23% of household power use is consumed by devices on standby and suggests that 98% of this unnecessary standby power can be effectively 'unplugging' the offending devices when they are not in use. The proposal indicates that this information came from a study, but references to the study are not provided. In fact, there are no citations of credible sources for any of the statistical data presented throughout the proposal. This is a major omission. Data which cannot be verified cannot be used as a business plan basis.

The proposal describes two types of products which are currently offered that provide similar mains disconnection to conserve standby power – one based on an internal timer and the other based on a wireless remote control. The proposal indicates that Altum is a vast improvement over these technologies since it does not require the user intervention to enable the mains power.

Score: 10

Technical Practicality (20 Points): *Will this product work technically?*

- The team must show that its product does not break any physical laws.
- The team does not have to show proof that the product will work, but should show an understanding of what research or experiments are needed to prove that it will work.

The product does not break any physical laws in that you can certainly produce a switch to disconnect an electrical appliance, and you can certainly use a microcontroller to operate that switch based on some schedule or other control mechanism. That's about where things start to get hazy.

If I wander about the typical house categorizing electrical devices, I find they fall into three groups:

- a) those that are necessary to operate the house (eg: refrigerator, stove, water heater, environmental control such as heat and/or A/C, washer/dryer, dishwasher, clocks, cable/dsl modem, network router, wireless access point, Ethernet switch, etc)
- b) those that are used frequently for individual purposes (eg: lighting, audio/video entertainment including cable/satellite boxes and recording devices, computers/smartphones/tablets, small appliances, etc)
- c) those that are used occasionally for individual purposes (eg: small appliances that are used infrequently, paper shredders, sewing machines, power tools, vacuums, etc)

There is a fourth category – medical devices – which I'll exclude from the discussion for obvious reasons.

I can't imagine putting something on group A devices; they need to run when they need to run and any minimal power consumed when they are 'idle' is necessary for proper control of their operation. I especially could not kill the network or Altum could not communicate with the cloud-based resources to know when to turn things on.

There are Group B devices which also cannot be unplugged when not in use. The cable/satellite box is a good example. Yes, it brings programming to the television, but it also has a clock, a digital video recorder, and a very long start-up cycle making it very unattractive to power down. Nearly all the group B devices either draw zero power when they are not in use (like a toaster or can opener) or are Energy Star rated.

Group C devices are generally unplugged and stored when not in use so they don't have any idle power draw.

The other difficulty I see is how, with only a one day monitoring cycle, can Altum know when I want to use a device and have it connected to the mains? Suppose I give Altum control of my TV. I watch different programs on different days of the week; you cannot predict my viewing habits based on one day's monitoring. And while I generally don't watch TV during the day (because I am at work), what happens when I stay home sick? How do I override the cloud-generated schedule? With the phone app? Wouldn't that make Altum the same as a timer based device with a remote control override? And what happens if there is something wrong with my network (or I don't have a wireless network)?

As hard as I try, I cannot think of a device where Altum would make sense for my house, and I definitely know that 23% of my electric usage is **not** standby power.

Score: 10

Marketability (10 Points): *Understanding of the key markets for their product must be demonstrated.*

- Who is the buyer?
- Will the team pursue government Research & Development (R&D) grants, licensing to another company, or create an entrepreneurial startup?
- Is there data showing how similar products have been successful?

The proposal indicates that Altum would be sold through mass retailers such as The Home Depot, and that the initial target market would be low income households in the American south. The rationale for this chosen demographic is two fold: a) because the lower the household income, the higher percentage of that income must be used to pay the electric bill, and b) because according to an uncited Groundswell report, electric bills are higher in the American south due to the climate. This may be true, but how will Altum reduce that power usage? Electric usage in the American south is higher because it is hot and in many places humid. All that power is for air conditioning which isn't something that has any stand-by power draw. Altum will not have any impact on that usage.

It does not seem like the team really understands the market and how their product may address a need.

Score: 5

Costs (10 Points): *The team should break down estimated costs of taking this product to the chosen market.*

- Costs should include any material estimates, R&D (including grants), market studies, and labor costs.
- Teams should include costs for the team to participate at Innovation Summit.
- Teams should be as detailed as possible.

The proposal describes the Altum device as having a male plug (to connect to the mains), a female socket (to connect to the unit being controlled), an AC ammeter to measure the current draw of the device, a smart microchip to read the data and send it to the cloud-based service, and an 802.11x wireless interface for this communication. The proposal then estimates that the total material costs for one Altum device will be "...20 cents for the smart chip in the device and 30 cents for motors and physical parts for a total of 50 cents per device."

As a product development Engineer for 40+ years with experience sourcing parts in Asia I can say with confidence, "no".

The proposal does not provide any cost information for finishing the development of the Altum device, the Altum app, and the cloud services software, production and packaging costs, testing and regulatory compliance costs, sales support costs (someone's gotta take the orders and ship the boxes), and the back-end costs for operating the cloud-service servers.

The need for 2500ft² of warehouse space seems unnecessary if just-in-time manufacturing methods are used. Also, most big-box stores have their own distribution networks. Suppliers deliver product to these regional centers where it is inventoried and distributed to the stores.

Costs for attending the Summit are included, although I'm not sure that the \$40 food per-diem is going to get you very far in Central Florida.

Score: 5

Industry Relevance (15 Points): *How important is the idea to the industry?*

- Does the product represent a substantial improvement in its industry or are there already products on the market that fill the need?
- The team should list examples of similar products, including patent searches or other examples of technology on the market, and explain how its product is an improvement of what already exists.

Saving energy? Relevant. Does Altum represent a substantial improvement in its industry? I don't believe so.

I think that the proposal is based on a false premise – that in 2017, an average of 23% of household energy consumption goes to devices which are in standby modes. In 1997? Maybe. In 2017? No. Electrical devices have become significantly more efficient. We don't have tube-based televisions that consume power on standby to keep the cathode heaters warm, we have flat panel televisions that consume fractions of watts in standby. We don't have as many desk-top style computers with high power draw when left on while not in use, we have laptops and tablets that consume practically nothing while in standby. We have replaced incandescent lighting with fluorescent and LED alternatives.

Further, I think that the application of this false premise to the regional power consumption data for the United States is non sequitur. Similarly, the proposal states that with a price not exceeding \$20, the product will pay for itself in a month. The average electrical cost in my area is 5 cents (\$0.05) per kWh. Allowing a 31 day month, Altum would have to reduce my monthly power consumption by 400kWh to realize a \$20 savings. That's just over 537 watts per hour for the entire month. That's a lot of power.

The proposal does describe other products available to help reduce standby power consumption through mains disconnection, but dismisses them as having operational flaws such as needing to press the button on a remote or reach down to the switching device to activate it. These devices, the proposal states, *"...represent only a small improvement upon the analog solution of physically unplugging devices. They rely on human planning and foresight to save electricity by setting timers, and thus represent suboptimal products."*

"In comparison," it continues, *"Altum presents an autonomous service that requires minimal human input for an autonomous user experience. Because it disconnects using intelligent software and not relying on human judgment, Altum is a much more optimal product in comparison to anything currently on the market. It is the first standby power product to take responsibility nearly completely out of the user's hands."* Be afraid; be very afraid...

It would be interesting to see what the development team could come up with by taking some of the existing products and addressing what could be considered their weaknesses.

Score: 8

Funding Mechanisms (10 Points): *Does the team understand the basics of how its product could be funded?*

- If it is relatively simple, can the team raise money for prototypes and begin sales through friends and family?
- Does the team need to consider grants, loans, or bringing on investors or partners in their efforts?

The proposal suggests using social networking and crowd-funding as the source of initial USD \$14k in capital. Additionally, the proposal suggest applying for space in some local business incubators with the implications that the incubator will also provide sources of working capital.

No other funding mechanisms are described.

Score: 5

Team Story (15 Points): *Introduce your team to the potential investors.*

- How did the team form?
- What roles did each member play?
- What barriers or hurdles did the team overcome to develop its idea and complete its business plan?

Note: In previous years, this section also included the following items. Comments relative to these items will not be included in the scoring but are provided as feedback to the team.

- Graphic Concept - Is the product design clear and easy to understand visually? Did the team produce quality graphics in professional manner? Did the graphic representation enhance the overall business plan?
- Product Video - Did the video clearly explain the product and need? Was the video engaging for future investors? Did the team's video enhance the overall business plan?

The proposal provides a brief introduction to the team members and their backgrounds, describing the contributions made by each member to the Altum product. Little detail is provided outlining any obstacles which were overcome during development and proposal preparation.

The video was well produced and included relevant graphics. The graphics provided in the proposal were simple but adequate for the purpose.

Score: 10