

Tripple-Bottom-Line Analysis: Sit-Stand Desks vs Regular Desks

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1- Source: <http://www.kareproducts.com/sit-stand-desk>



-electric-30d-36l-legs-p-1803.html

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ABSTRACT

This project was originally assigned as part of UBC's SEEDS sustainability program, an initiative whose vision is to help form collaborations between students and faculty on innovative projects that align with UBC's values. The implementation of sit-stand desks throughout the University of British Columbia campus has been an area of interest for its faculties and governing bodies. Although a small number of desks have been installed in various faculties (Abigail Overduin, personal communication, March 29, 2016), no steady plan has been developed for a full-scale campus wide implementation. Others research tends to focus primarily on the health benefits of the sit-stand desk and falls short of a complete analysis, specifically using the triple-bottom-line (TBL) approach. This report provides a solution that encompasses a wide variety of factors from economic, social and environmental or TBL. Using this approach we were able to develop a balanced sit-stand desk execution plan without bias towards one of the latter three factors.

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GLOSSARY

Sit-Stand Desk	A height adjustable desk that allows the user to rotate between sitting and standing
Triple-Bottom-Line	A three part accounting framework composed of environmental, social and economic impact. Used to evaluate performance
Green Guard Certified	Indicates that the production of an indoor product adhered to strict chemical emission limits
Intervention	In this case refers to a wide scale introduction of sit-stand desks into an office workspace or environment
Sedentary	Spending a large portion of one's time sitting down or inactive.
MSR Accelerometers	A device used to detect acceleration and general motion
Perfluorocarbons	Compounds that contain only Carbon and Fluorine. Are strong greenhouse gases

LIST OF ABBREVIATIONS

SSD	Sit-Stand Desk
LBP	Lower Back Pain
TBL	Triple-Bottom-Line
NUBC	Non-UBC stake holders
UBCP	UBC Purchasing
UBCT	UBC Technicians
UBCD	UBC Desk Users

1.0 INTRODUCTION

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Is your office chair slowly killing you? Although you should not expect your chair to suddenly develop a sense of being and come after you like something comparable to a D-list movie, there is a partial truth to that statement. Recent studies have shown that prolonged sitting can have a detrimental effect on one's health and can even lead to premature death ("AMA to offices...", 2013). With the vast majority of faculty and staff using desks in their daily routine, it is no surprise the SEEDS program and the Human Resources Department at UBC are curious about an alternative to this early death-sentence. One possible solution that researchers have been looking into for this health risk is sit-stand desks. This report will explore the implications and supposed benefits of installing sit-stand desks from the Triple-Bottom-Line view point.

Firstly, the report will explore the validity of sit-stand desks in terms of economics. This will include, but is not limited to: where to purchase the desks, the cost to dispose of the old desk and the price of installation.

Furthermore, the health, comfort and productivity sections will primarily focus on the social impacts that the desks will have on all those affected by the implementation and use of sit-stand desks. Taking advantage of the vast amount of research done on sit-stand desks in the last few years, this report will examine and provide a comprehensive analysis of the relevant data.

Lastly, the environmental impacts of a mass installation of sit stand-desks will be analyzed. With every new desk there will be one desk that needs to be re-furbished or thrown out. Various options that could result in a decrease to the environmental impact due to the installations of sit-stand will also be discussed.

1.0 INTRODUCTION

In conclusion, using the TBL, this report hopes to be a guide for UBC if or when it decides to implement a full-scale sit-stand desk replacement. With the knowledge gained from this report, the economic, social and environmental impacts have the potential to be mostly positive, resulting in a smoother transition towards a campus wide sit-stand desk replacement program.

2.0 ECONOMIC ANALYSIS AND FEASIBILITY

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For the “cost and economic impact” portion of this report, the economic impact of a full disposal of old desks and purchase of new desks will be broken down into Non-UBC Stakeholders (NUBC), UBC purchasing (UBCP), UBC technicians (UBCT) and UBC desk users (UBCD). This is a simplified list for purposes of this report.

Through email correspondence it is easy to tell that NUS companies are salivating at the chance to refurbish the entirety of UBC. Although the SSDs would probably not be made in Canada (as costs associated are much more than made out of country) a mass purchase would give NUBC British Columbians involved in the list of aspects below work for potentially several weeks to several months, depending on the amount purchased, but this would consequently also cost UBCP a large amount of money. The main aspects being referred to are;

1. Purchase of new desks or adjusting brackets - UBCP
2. Delivery of new desks – UBCP, NUBC, UBCT
 - a. The stakeholder involved would be dependent who would be transporting the deliverables.
3. Installation of new desks or adjusting brackets to old desks – NUBC, UBCT
 - a. The stakeholder involved would be dependent on who would be chosen to do the installations.
4. Physical destruction or removal of old desks – NUBC, UBCT
 - a. The stakeholder involved would be dependent on who would be chosen to tear down or remove the old desks.
5. Recycling, reusing or discarding old desks – NUBC, UBCP
 - a. Recycling

2.0 ECONOMIC ANALYSIS AND FEASIBILITY

- b.
 - i. Includes finding a recycling plant, sorting the different components of the desks into recyclables and non-recyclables
 - ii.
- b. Reusing
 - i. Deciding where to put the old desks or who to give them to.
- c. Discarding
 - i. If recycling or reusing is deemed to have too many associated costs then instead send them to the landfill.

One way that UBC could save is by sourcing everything to one company and getting an all in one deal with staff that know what they are doing when it comes to shipping, installation and disposal instead of having to reference several different companies for all different aspects. If all services were to be outsourced individually then the price would increase. It is difficult to say by how much without more information about the old desk as the material, weight and dimensions of the old desks all affect aspect 2-4 (2 if the adjusting bracket only is purchased), as will be seen in the emails with Alex Later.

Some of this could also be done in house by the UBC Technical department, but this would take up valuable time and they would also have a longer learning curve for installation in the beginning of the endeavour since they are not fully trained in the installation of the desks as will be the employees of the company purchased from.

2.0 ECONOMIC ANALYSIS AND FEASIBILITY

2.1 POTENTIAL SUPPLIERS

The Source

I had several email conversations with Alex Later from Source Office Furniture and Systems Ltd. This will be sent electronically with an electronic copy of the report.

The source claims to be GreenGuard Certified. Refer to this website for more details to see if this meets UBC standards of sustainability.

<http://greenguard.org/en/certificationprograms.aspx>

Canadian Brands

It seems from internet searches that all Canadian made products are custom and not made for mass scale. This would increase the price by a large margin. I tried contacting several companies for prices but there were no responses.

Online purchasing

Although some of the cheapest options for desks can be found online it would need to be determined whether or not these companies deliver and install. If not, the associated costs of delivery and installation must be determined and added into the final cost.

Questions

- Ask for an hourly rate for install and disposal.
- Can I buy the base and connect it to existing desks?

2.2 SUGGESTIONS AND COMMENTS

My Suggestions

- If a company does not provide delivery, install (and optional disposal) then they should not be considered. Due to:

2.0 ECONOMIC ANALYSIS AND FEASIBILITY

- Longer learning curve for install compared to trained professionals.
 - Logistics if delivery were not provided would be intolerable.
 - Disposal would also be more difficult.
- You need to determine all of the different kinds of desks that you will be getting rid of to give the companies more of a grasp of what they will need to dispose of and/or modify. They need to know:
 - Materials
 - Dimensions
 - Weight
 - All of this can probably be determined from the make and brand of the desk
- One suggestion would be to provide electronic SSDs (automatic) for people with physical disabilities and a crank style SSD for able bodied individuals. This way the more expensive option of electric style SSD would only be provided to a select few who are unable to use the conventional crank style mechanism.

Comments

The actual pricing and cost for this project has too many variables to consider and there may be more than that presented here. It is for this reason that an actual cost could not be delivered but instead a summary of separate aspects could be for the accounting department to further investigate. One of the variables that would be difficult to determine are what kind of desks are already in use at UBC. Each building assuredly has their own kind of desk and it would take many hours to determine if they are made from recyclable or reusable material and if it is possible to attach a lifting bracket to them.

3.0 EFFECTS OF SIT STAND DESKS ON OFFICE WORKERS

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In this section of the report we will discuss the various effects that introducing SSDs into office workspaces may have with regards to the Faculty and staff that would actually be using them. The information here is compiled from various studies that focus on the benefits utilizing SSDs may have for workers. We will outline the benefits that SSDs have provided to consumers in the past, then comment on why these benefits make implementing a Sit-Stand desk intervention at UBC a wise option.

3.1 HEALTH EFFECTS

Various health experts are claiming that sitting for extended periods of time during the day may have detrimental effects on one's health. Given that a large portion of today's workforce possess sedentary jobs, it seems only natural that we should seek out alternatives to conventional desks so as to mitigate some of these harmful effects. Many studies have been successful in demonstrating that sit stand desks may help alleviate chronic back pain, reduce the risk of diabetes, and help workers burn more calories throughout the day.

According to research conducted by Buckley et al. at the University of Chester, the cardiovascular and metabolic benefits of SSDs span over a range of heart beat rates, calories burnt per minute, and glucose concentration in the blood of subjects. Buckley et al. concluded that standing up while working increases the heartbeat of patients by 10 beats per minute compared to sitting down. An additional 0.7 kilocalories are burned standing up compared to sitting down per minute. Moreover, the concentration of glucose in the blood of patients took a lot longer to decrease when sitting down; an average of 106 minutes from peak to trough. While standing up, patients averaged 60 minutes to dilute the glucose concentration from peak to trough. An illustration of these numerical

3.0 EFFECTS OF SIT STAND DESKS ON OFFICE WORKERS

comparisons is shown in Figure 1. While it is difficult to assess how much these health improvements vary among subjects, it is generally accepted that the alternation between sitting and standing does indeed hold—to some degree specific to every individual—a beneficial influence on the state of wellbeing of subjects.

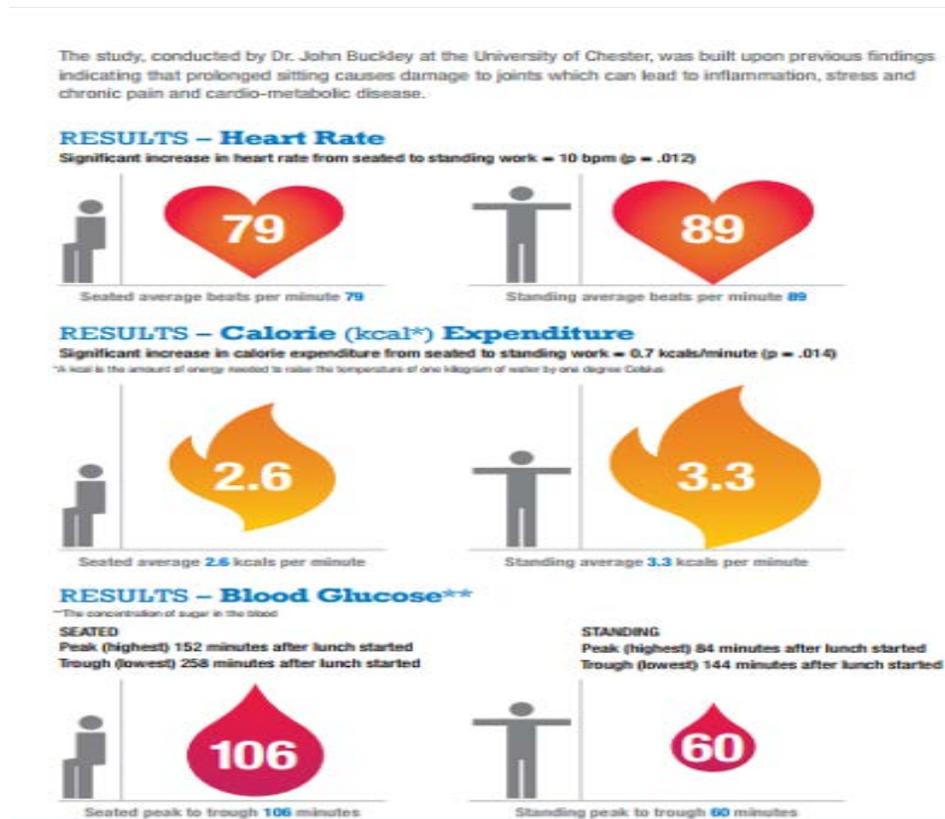


Figure 1

One of the main reasons why SSDs are generally studied is their link to ameliorating LBP (Lower Back Pain). Ognibene et al. conducted a 12-week long study on 46 different university subjects as compared to a control group—in this context, a group without access to SSDs. After 15 days of starting the study, the “intervention group”, which is to say, the 46 subjects, were given SSDs and were told to alternate between sitting and standing as best suited their LBP. The control group remained at work sedentarily. After

3.0 EFFECTS OF SIT STAND DESKS ON OFFICE WORKERS

30 days (15 days after having tried SSDs) participants who were given access to SSDs reported a significant reduction in current ($P=0.02$) and worst ($P=0.04$) LBP over time. Research is still to be made on larger sample test groups to more accurately represent the true diagnosis of LBP improvements caused by SSDs. Nonetheless the notion that LBP can be countered by the use of SSDs within the workspace is consistent with the latest physiological research and knowledge, and so is therefore strongly suspected of being the direct source of the effects discussed in this research.

3.2 WORKPLACE PRODUCTIVITY

A common issue with sitting for long periods of time is that one often starts to feel heavy and lethargic which can lower one's overall productivity. Here we will examine how, with the use of SSDs, workers are able to remain alert for a greater portion of the work day. Of course, productivity and overall well-being are intimately related subjects, and so many of these studies that suggest SSDs may help keep workers energized and motivated also suggest that removing sources of worker discomfort (by introducing SSDs) may help improve productivity as well.

One study conducted on 28 sedentary office workers by Dutta et al. examined the relation between changes in sedentary time during work and the overall sense of wellbeing reported by subjects. Subjects were treated with "MSR accelerometers" to track the amount of time they spent sitting and standing during work hours, as well as the amount of time walking (and the walking speed) on extracurricular hours. While no extracurricular increase in physical activity was noted, the patients reported feeling more relaxed, calm, energetic, and less fatigued/sluggish. These secondary effects are arguably very influential on a subject's overall mood. Dutta et al. referenced physiological studies that indicate that standing, compared to sitting, recruits more muscle fibers and

3.0 EFFECTS OF SIT STAND DESKS ON OFFICE WORKERS

stimulates blood flow, which may help with alertness and maintaining energy levels and focus on certain work tasks and office interactions. An illustration of these effects is shown in Figures 2 and 3. This study does not conclusively establish whether the constant stimulation of blood flow can be effective in countering diseases such as arthritis or diabetes, although some studies are said to be in progress to clarify how truly effective this can be for patients who have disabilities or are overweight.

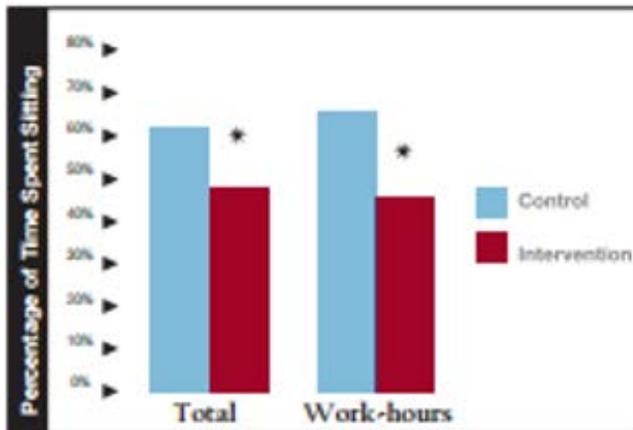


Figure 2

	Control Period (scale of 1 to 5)	Intervention Period (scale of 1 to 5)	Treatment effect (p-value)
Relaxed	3.4	3.5	0.02
Calm	3.4	3.5	0.004
Energetic	3.2	3.3	0.03
Not Tired	3.6	3.7	0.05
Not Hungry	3.7	3.9	0.06
Not Sluggish	3.9	4.0	0.01
Overall Wellness	3.4	3.5	0.008

Figure 3

3.3 RECOMMENDATIONS AND COMMENTS

- The research above is randomized and large enough to sustain confidence in predicting a similar nature of impact (of SSDs) within UBC
- Access to SSDs should be prioritized to individuals with physical disadvantages or health problems which can be improved by the effects of SSDs described previously.

3.0 EFFECTS OF SIT STAND DESKS ON OFFICE WORKERS

- An application process consisting of chronological and physical priority should be in place to address each Faculty member/ Staff
- A doctor's note should *not* be a requirement to purchase a SSD while in-line
- Staff should have public access to proper instruction on *how* to operate a given SSD properly

4.0 ENVIRONMENTAL IMPACT

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Material wise, the two desk types are quite similar. Both use some type of processed wood for the main structure along with metal components for various parts of the desk like sliding or rolling drawer mechanisms and joints. The difference between the desks' materials comes from the extra function of the sit-stand desk, the adjustable height. Because it needs to be adjustable and preferably not manually, there's a need for a motor and mechanism to translate the motor motion into the horizontal motion of the desk top. The extra parts are mainly made of metal, steel or aluminum for extra structural support and power train mechanism and steel, copper and plastic for the motor and wiring. The environmental analysis will be split up in two main sections. The first section will focus on environmental impact due to the manufacturing of the desks' materials. The second section will go over the end life of the two desk types.

4.1 MANUFACTURING

Starting with the most common material in a desk, wood in itself represents a significant carbon stock that is stored for different periods of time depending on the product. Although, depending on material the values change significantly, in most cases using wood actually provides a carbon credit due to the fact that the amount of carbon stored is higher than the amount of carbon released during manufacturing (Bergman, 2012). A lot of the wood products used for manufacturing in BC are grown locally and hence little emission is associated with the transportation of the wood. Because the two desk types have similar amounts of wood, it is safe to say that the environmental impact would also be similar assuming approximately the same amount of material used for the production of the desks.

Steel is used for various slider or roller drawers, joints, and often legs of the table. Although, the steel production industry has made significant reductions in greenhouse gas emissions (WorldSteel, 2015) there is still a significant carbon footprint due to the use of

4.0 ENVIRONMENTAL IMPACT

this material. The amount of carbon emission varies greatly depending on the source of power used. Therefore further research into the steel manufacturers is needed once an array of desks is selected.

Aluminum is quite similar to steel based on the functions it is being used for and that its extraction and refinement produces large amounts of emissions. In 1995, it was estimated that the production of aluminum contributed to about 35 million tons of carbon equivalent in the form of perfluorocarbons, PFCs. This contributed to about 60% of PFCs emissions worldwide (Harnisch, 1999).

The environmental impact of using these materials could be minimized if using recycled material. Some desk manufacturers provide information on where their material comes from, but in general this information needs to be researched for each manufacturer.

4.2 END OF LIFE

4.2.1 MATERIAL IN REGULAR OFFICE DESKS

There are few options when it comes to getting rid of old furniture in Lower Mainland. First is reusing the old furniture by selling it or donating it. There are a few resources readily available for both of these options. One of such resources is Vancouver Reuses. This service allows businesses and individuals alike to create listings for the items they would like to donate. In case, with UBC the number of desks needing to be exchange could be very high, therefore, finding people to take 100+ desks could be challenging. Second option is recycling the desks. Similarly to Vancouver Reuses, there are businesses in lower mainland that pick up the furniture to be recycled and reuse as much as they can to build new furniture or use the material for other purposes. An example of such a service is Furniture Pickup. The company charges a nominal fee on item pickup depending on the number and size of items. Third, the least desirable option is sending the desks to the landfill. There are different services for this as well, ranging from the City of Vancouver

4.0 ENVIRONMENTAL IMPACT

Landfill to private junk removal companies like Just Junk. Both charge nominal fees based on material, size, and weight of the item to be thrown away.

4.2.2 POWER TRAIN AND MOTOR

Disposal cost for the power train and motor part of the sit-stand desk, based on BC Recycling Hotline (604-recycle) resources, is estimated to be neutral. The aluminum can be sold to Davis Trading (604-255-3111) at \$5/lb., steels can be recycled by them for free. Depending on the power options, battery compared to power outlet, there might be a need for extra recycling. In such a case, various types of batteries, including lithium batteries, can be recycled at Free Geek for free. The motor can be recycled by Davis Trading; however, more information from motor manufacturer is required to determine its material in order to recycle it; assuming the amount of valuable material will be over \$5 it could be recycled for free at Davis Trading.

4.3 CONCLUSION

From an environmental standpoint, since more material is needed to produce a sit-stand desk, there is, in general, a greater larger environmental impact. Most of the pollution is due to raw-material extraction and refinement needed to make the power-train and motor. End-life analysis for both desks yields similar results because most of the extra material in the sit-stand desk is recyclable. The wood is the more non-recyclable material within the desk. Metals like copper, steel and aluminum are reasonably easy to recycle for free. The results presented here are for average desks and could vary based on the specific units and the amount and type of material used.

5.0 CONCLUSIONS AND RECOMMENDATIONS

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Our research looked at three different models of implementation of sit-stand desks at UBC. Through our investigation on the sit-stand desk implementation the result was that led us to the conclusion of phasing in the sit-stand desks with prioritization for those who have medical needs.

Firstly, the sit-stand desk replacement project will need a team of UBC staff that will oversee it. It is suggested that this team be made from existing faculty member and the work load incorporated into their current duties. Some faculty members of interest would be from the SEEDS program, HR and operational staff.

The “phasing-in” portion plan will be done per faculty and will require the support of the faculty members and staff. We do not foresee much objection from faculty to the implementation, but further research will have to be done as our research was only partially complete by the report deadline. The desk selection process will be done on a per faculty basis. The appropriate faculty members will be shown a list of desks (chosen by the sit-stand desk team) and their corresponding prices. Once the faculty agrees on an option depending on their preference and budget the first phase will commence. The first phase or first faculty building will set the precedence for further implementation of the program. Once the first building is refitted with sit-stand desk an assessment preferably from a member of the SEEDS program (graduate student or professor) using the TBL approach. This assessment can be used to show the benefits of the program and to gain support and funding of the program.

Within the “phasing-in” approach comes the side issue of who gets their desk first within the faculty. We came to the conclusion that the best and most fair option would be to allow faculty and staff with immediate medical needs to receive their desks first. Faculty and staff will have to submit a specialist recommendation to receive medical

5.0 CONCLUSIONS AND RECOMMENDATIONS

priority. This initially seems problematic, but our research shows that the speed at which the desk are installed will minimize and discrepancies caused by preferential treatment.

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