CHAPTER II

REVIEW OF RELATED LITERATURE AND STUDIES

2.1 Vending Machines: A Narrative Review of Factors Influencing Items Purchased

According to Sophia V. Hua, MPH (2016) vending machines are a ubiquitous part of our food environments. Unfortunately, items found in vending machines tend to be processed foods and beverages high in salt, sugar, and/or fat. The purpose of this review is to describe intervention and case studies designed to promote healthier vending purchases by consumers and identify which manipulations are most effective. All studies analyzed were intervention or case studies that manipulated vending machines and analyzed sales or revenue data. This literature review is limited to studies conducted in the United States within the past 2 decades (ie, 1994 to 2015), regardless of study population or setting. Ten articles met these criteria based on a search conducted using PubMed. Study manipulations included price changes, increase in healthier items, changes to the advertisements wrapped around vending machines, and promotional signs such as a stoplight system to indicate healthfulness of items and to remind consumers to make healthy choices. Overall, seven studies had manipulations that resulted in statistically significant positive changes in purchasing behavior.

2.2 Recent advances in printable thermoelectric devices: materials, printing techniques, and applications

According to Md Sharafat Hossain, Tianzhi Li, Yang Yu, Jason Yong, Je-Hyeong Bahk, Efstratios Skafidas RSC Advances 10 (14), 8421-8434, (2020), thermoelectric devices have great potential as a sustainable energy conversion technology to harvest waste heat and perform spot cooling with high reliability. However, most of the thermoelectric devices use a toxic and expensive material, which limits their application. These materials also require high-temperature fabrication processes, limiting their compatibility with flexible, bio-compatible substrate. Printing electronics is an exciting new technique for fabrication that has enabled a wide array of biocompatible and conformable systems. Being able to print thermoelectric devices allows them to be custom made with much lower cost for their specific application. Significant effort has

been directed toward utilizing polymers and other bio-friendly materials for low-cost, lightweight, and flexible thermoelectric devices.

2.3 Compatibility of 3-D printed devices in cleanroom environments for semiconductor processing

According to Toni P Pasanen, Guillaume von Gastrow, Ismo TS Heikkinen, Ville Vähänissi, Hele Savin, Joshua M Pearce, Materials Science in Semiconductor Processing 89, 59-67, (2019) 3-D printing has potential to revolutionize manufacturing of customized low-cost scientific equipment, and numerous self-designed applications have already been realized and demonstrated. However, the applicability of 3-D printed devices to cleanrooms used for semiconductor processing is not as straightforward, as the controlled environment sets strict requirements for the allowed materials and items. This work investigates the opportunity to utilize 3-D printing in cleanrooms by analyzing three potentially suitable polymers (polylactic acid (PLA), acrylonitrile butadiene styrene (ABS) and polypropylene (PP)) for two applications that do not require particular chemical compatibility: a custom single wafer storage box and a wafer positioner for a metrology system.

2.4 Solar Powered Reverse Trash Vendo Machine

According to Alexis John M Rubio, Joan P Lazaro Asia Pacific Journal of Multidisciplinary (2016), the study was conducted with the purpose of developing a Solar Powered Reverse Trash Vendo Machine that aims to encourage people to engage in recycling and to diminish the practice of improper waste disposal in the Philippines. The device used a Gizduino X ATMega 1281 as its main processing module along with a Gizduino 644 microcontroller board, anda GSM Shield module for communication. Arduino1. 6 IDE is used to program the Gizduinoboards. The device is powered by a 15V rechargeable battery, which is charged by a solar panel retrofitted at the roof of the device, this is to promote energy conservation, and green

engineering principles in the development of the study. The device can process empty plastic bottles (500ml. max) with a base diameter of 3.5 inches, and aluminium cans. These recyclable materials are placed inside the machine and is scanned, then crushed and placed in a bin. An inductive sensor is used to detect either the material is a plastic bottle or an aluminium can. To compensate the user for recycling, an equivalent monetary value will be dispensed. The owner of the device can check the status of the coin dispenser and bins through an Android messaging application developed using the Eclipse IDE and the Java programming language, and when a certain limit is reached by the coin dispenser or the trash bins, an automatic text message notification will be sent to the owner.

2.5 Development of reverse vending machine (RVM) framework for implementation to a standard recycle bin

According to Razali Tomari, Aeslina Abdul Kadir, Wan Nurshazwani Wan Zakaria, Mohd Fauzi Zakaria Procedia Computer Science (2017), Nowadays with the increasing amount of waste generated and limited landfill space for waste disposal, recycling is one of the important approaches to manage the waste effectively. The current manual recycling practice in which the user need to bring the waste in bulk to the recycling center might be hassle and hence become a discouraging factor for them to recycle. To overcome such an issue, in this project an automated recycle bin with a reward feature is proposed that derived from a reverse vending machine (RVM) concept. Basically, the system is implemented in a standard recycle bin provided by local municipal that equipped with microcontroller and collection of sensors. Throughout the process, the sensors responsible to identifying user information, weight the scale and eventually convert the weight to the corresponding points automatically. Once the process completed, the user can claim their points by using RFID point card. All the mentioned process will be controlled by a microcontroller. The system has been implemented in a small scale user testing and the framework shows its effectiveness for handling the whole process. The prototype is expected to aid in accelerating the motivation among Malaysian to recycle their waste, and can be one of the frameworks to overcome urban poverty issue by using waste to wealth concept.

2.6   A Simple Approach to Design Reverse Vending Machine

These days the increasing in amount of waste generated by human's and limited landfill sites for dumping waste, recycling it is one of the novel approaches to manage the waste effectively. The present recycling practice in which the people need to bring the waste in bulk to the recycling centre might bother and become a discouraging factor for them to recycle. To overcome such an issue, an automated recycle bin designed and installed in many countries on subways, malls etc. with a reward featured is developed from a reverse vending machine (RVM) concept. In present time, Reverse Vending Machine is become very popular in countries like Greece, Japan, Europe, South Korea, America and China. Reverse Vending Machine (RVM) reduce employee work, saves time and energy also motivate human's being, even cost effective. In this paper we explain about the working of Reverse Vending Machine based on fraud detection sensors which start to work after inserting the plastic material into it and that plastic is checked by the series of sensors. There are very attractive rewards for the users of Reverse Vending Machine; they get coins as a reward. This paper explains the simulation of Reverse Vending Machine with fraud detection with Strain Gauge Weight Sensor, Capacitive Proximity Sensors and Infrared Photoelectric Sensor to detect fraud (Aditya Gaur, Dilip Mathuria (2018).

2.7   Vending machine foods: evaluation of nutritional composition

The nutritional quality of vending machine foods may be a factor that contributes to significantly increase obesity and associated diseases, and the vending industry is significantly growing worldwide. This study aims to evaluate the nutritional composition of vending machine foods and to compare it with the consumption of the Gran Canaria population. Food products from 74 snack and 71 refrigerated vending machines located in Las Palmas (Gran Canaria), and on university campuses, were nutritionally assessed. The percentages of sales per food type were accessed during a 12 month-period to verify user preferences. Significant differences ($p < 0.05$) were found in the content of nutrients compared with the Kruskal-Wallis test with all the food groups. Sandwiches (wholemeal and white bread) had the lowest energy levels, while croissants had the highest. We highlight the increased sodium content in baguettes compared to the other foods. The findings suggest that vending machine foods contain

more fat/saturated fat, calories and sodium than recommended. Further studies on the nutritional assessment of vending machine foods, governments' awareness and policies that promote the intake of healthy foods are essential to increase the amount of foods with an appropriate nutritional profile according to recommendations in vending machines (António Raposo, Conrado Carrascosa (2016).

2.8 An (un)healthy poster: When environmental cues affect consumers' food choices at vending machines

According to Sabrina Stöckli, Aline E Stämpfli (2016), Environmental cues can affect food decisions. There is growing evidence that environmental cues influence how much one consumes. This article demonstrates that environmental cues can similarly impact the healthiness of consumers' food choices. Two field studies examined this effect with consumers of vending machine foods who were exposed to different posters. In field study 1, consumers with a health-evoking nature poster compared to a pleasure-evoking fun fair poster or no poster in their visual sight were more likely to opt for healthy snacks. Consumers were also more likely to buy healthy snacks when primed by an activity poster than when exposed to the fun fair poster. In field study 2, this consumer pattern recurred with a poster of skinny Giacometti sculptures. Overall, the results extend the mainly laboratory-based evidence by demonstrating the health-relevant impact of environmental cues on food decisions in the field. Results are discussed in light of priming literature emphasizing the relevance of preexisting associations, mental concepts and goals.

2.9 Design of a high-tech vending machine

According to Vennan Sibanda, Lorraine Munetsi, Khumbulani Mpofu, Eriyeti Murena, John Trimble (2020), Imagine, paying and placing an order in a food outlet only to wait for an extra twenty to thirty minutes to get the ordered products. How tiring. This is the current situation in different food outlets and shops. What if we could save time by 75% to 83% and get an order in five minutes or less? This can be achieved by the design and development of a fully fletched high–tech vending machine. Current vending machine owners are facing challenges from hacking and vandalism. The aim of this paper is to design a high-tech vending machine that can dispense a variety of products at the

same time. The machine uses fingerprint sensors and other high technological features for security and user-friendliness. The security system which uses biometrics for opening and closing doors was interrogated and used. An advertising platform was developed using HTML, JavaScript and CSS to cater for different products on offer. The alarm system is interfaced with a servo motor and a buzzer for providing added security. Sublime Text was used for creating a website and XAMPP was used for port forwarding. The result is a fully fletched vending machine that can safely vend about fifteen products or more all housed in a robust cabin.

2.10 The impact of buyer-supplier relationship quality and information management on industrial vending machine benefits in the healthcare industry

Despite the calls for a deeper understanding of SCM in the healthcare industry, theoretical research focused on healthcare buyer-supplier collaboration, specifically inventory management issues, remains nascent and fragmented. Although slow to change, healthcare organizations have begun to consider alternative inventory management systems to improve inventory control and patient care. Industrial vending machines (IVM) can help healthcare organizations address inventory management issues. Grounded in transaction cost economics and contingency theory, this research develops and empirically tests a model that highlights the critical role of information management in the link between buyer-supplier relationship quality and performance outcomes within the context of IVM implementation and use in the healthcare industry. Based on survey data from healthcare managers, results indicate that both information management and relationship quality are tied to a series of benefits in the context of collaborative buyer-supplier IVM agreements (John F.Kros, Jon F.Kirchoff (2018).

2.11 NuiVend-Next Generation Vending Machine

Conventional vending machines require users to press buttons and respond to visual cues. This makes them less accessible to some users such as the blind. NuiVend resolves this issue by integrating natural voice commands and gesture interactions into a vending machine, thereby creating many alternative, natural, and more user-friendly ways of interaction. In this paper, we will discuss NuiVend's use of a variety of technologies. Such as: Microsoft Kinect, various Microsoft Cognitive API services, relay

and sensor boards, as well as the overall logic of the control software. Finally, we discuss potential improvements to NuiVend as well as Microsoft Language Understanding Intelligent Service (LUIS) techniques that can be applied to many other future NUI based projects (Robert Gruen, Erich Liang, 2016 International Conference on Computational Science and Computational Intelligence CSCI (2016).

2.12   Smart Coffee Vending Machine Using RFID

The vending machine which provides the beverage like snacks, cold drink, it is also used for ticketing. These systems are operated on either coin or note or manually switch operated. This paper presents system which operates not on coin or note, it operates on RFID system. This system gives the access through only RFID which avoid the misuse of machine. A small RFID reader is fitted on the machine. The identity card which contains RFID tag is given to each employee. According to estimation the numbers of cups per day as per client's requirement are programmed. Then an employee goes to vending machine show his card to the reader then the drink is dispensed. But when employee wants more coffees than fixed number, that person is allow for that but that employee has to pay for extra cups and amount is cut from the salary account (Advances in Wireless and Mobile Communications (ISSN 0973-6972 Volume 10, Number 4 (2017).

2.13   Water Vending Machine

According to Manish Navlakha, Lokendra Singh Rathore, Lovekush Sharma, International Journal of Engineering and Management Research (2017) water vending machines are available and operated on only one coin but our aim is to design water vending machine which is operated on different coins. In India there is problem of safe drinking water therefore we are going to provide mineral water. Water has become the most commercial products of the century. This may sound bizarre, but true. The stress on the multiple water resources is a result of a multitude of factors. On the one hand, the rapidly rising population and changing lifestyles have increased the need for fresh water. If opportunity costs were taken into account, it would be clear that in most rural areas, households are paying far more for water supply than the often-normal rates charged in urban areas. Also, if this cost of fetching water which is almost equivalent. To

150 million women days each year, is covered into a loss for the national exchequer, it translates into a whopping 10 billion rupees per year.

2.14 Preserving fresh fruit quality by low-dose electron beam processing for vending distribution channels

Food vending is estimated to be a $20 billion industry in the United States. There is an untapped business opportunity to positively influence nutrition and health by positioning fresh fruits and vegetable items as healthy vending items in vending machines. The hypothesis was that low dose (≤ 1 kGy) electron beam (eBeam) processing, alone or, in combination with Modified Atmosphere Packaging (MAP) is effective for developing fresh produce-based vending items. Shelf-life, sensory attributes, and consumer acceptability are key metrics for healthy vending items. The experimental objectives were to evaluate low dose eBeam (≤ 1 kGy) processing alone or along with MAP for red grapes, cherry tomatoes, and strawberries for reducing bioburden, while maintaining sensory attributes and consumer acceptability scores. The eBeam treatment at ≤ 1 kGy alone, or in combination with MAP suppressed bioburden by at least 1 to 2 log units over 21 day refrigerated storage as compared to untreated control samples. eBeam processing did not adversely affect the color or the firmness of the fruits. A consumer taste panel did not find any significant difference ($P \geq 0.05$) in acceptability of eBeam processed fruits (compared to untreated samples) in terms of appearance, odor, color, firmness and flavor. Overall, the results suggest that eBeam at low doses (≤ 1 kGy) alone or in combination with MAP can be a unique approach for developing healthy vending items (Bianca Smith, Shima Shayanfar, Rosemary Walzem, Christine Z Alvarado, Suresh D Pillai, Radiation Physics and Chemistry (2020).

2.15 Testing product, pricing, and promotional strategies for vending machine interventions with a college population

According to the study of Morgan success of vending interventions among college students may be improved by incorporating identified influential attributes for product, pricing, and promotional strategies. Participants' product opinion was most commonly related to taste. Participants' identified pricing levels were based on perceived healthfulness, affordability, and payment convenience. The highest scoring promotions

were described as having simple, clear health information and a visually appealing design. The majority of participants surveyed (70%) indicated they would purchase the product if it were in the vending machines on campus. However, 60% of participants used vending machines less than once per month, with the most common reasons for vending use being hunger (38%), lack of time (30%), and convenience (30%) and the most common reasons for vending product choice being price (20%), health (20%), taste (15%), and cravings (15%) (Morgan F Sowers, Sarah Colby, Katie Kavanagh, Wenjun Zhou, Journal of Foodservice Business Research (2019).

2.16 Promoting healthy choices from vending machines: Effectiveness and consumer evaluations of four types of interventions

According to Colin Bos, Ivo A van der Lans, Ellen van Kleef, Hans CM van Trijp, Food Policy (2018), vending machines often provide relatively energy-dense snack foods and beverages at a wide variety of points-of-purchase. Vending-machine interventions that stimulate low-calorie choices can therefore play a role in improving the healthfulness of the food environment landscape. The aim of this study is to examine the effects of four vending-machine interventions, varying in level of intrusiveness, on consumers' choices, consumers' acceptance of such interventions, and consumers' evaluations of the choice they made. Overall, the results suggest that restricting high-calorie options is a promising route to stimulate healthier choices from vending machines. As such, the present study provides intervention opportunities in the combat against obesity for governments and their potential allies, such as food manufacturers and the food service industry.

2.17 Drinking water quality of water vending machines

An increased in demand from the consumer due to their perceptions on tap water quality is identified as one of the major factor on why they are mentally prepared to pay for the price of the better quality drinking water. The thought that filtered water quality including that are commercially available in the market such as mineral and bottled drinking water and from the drinking water vending machine makes they highly confident on the level of hygiene, safety and the mineral content of this type of drinking water. This study was investigated the vended water quality from the drinking water

vending machine in eight locations in Parit Raja are in terms of pH, total dissolve solids (TDS), turbidity, mineral content (chromium, arsenic, cadmium, lead and nickel), total organic carbon (TOC), pH, total colony-forming units (CFU) and total coliform. All experiments were conducted in one month duration in triplicate samples for each sampling event. The results indicated the TDS and all heavy metals in eight vended water machines in Parit Raja area were found to be below the Food Act 1983, Regulation 360C (Standard for Packaged Drinking Water and Vended water, 2012) and Malaysian Drinking Water Quality, Ministry of Health 1983. No coliform was presence in any of the vended water samples. pH was found to be slightly excess the limit provided while turbidity was found to be 45 to 95 times more higher than 0.1 NTU as required by the Malaysian Food Act Regulation. The data obtained in this study would suggest the important of routine maintenance and inspection of vended water provider in order to maintain a good quality, hygienic and safety level of vended water (IOP Conference Series: Materials Science and Engineering (2016).

2.18   Impact of total vending machine restrictions on US young adult smoking

According to the study of Mike Vuolo they found that total vending machine restrictions decrease any recent smoking (OR = 0.451; p < .01), net of other covariates. Though the passage of a restriction does not alter an individual's smoking over time, living longer in an area that has a restriction lowers the propensity that an individual will smoke at all (OR = 0.442; p < .05). We find no effect of total vending machine restrictions on smoking a pack daily. Total vending machine restrictions appear to be an effective, yet highly underutilized, means of tobacco control (Mike Vuolo, Brian C Kelly, Joy Kadowaki, Nicotine & Tobacco Research (2016).

2.19   A simulation-optimisation genetic algorithm approach to product allocation in vending machine systems

According to Hanna Grzybowska the optimisation of logistic vending machine systems is decidedly complex. Product allocation to columns in a vending machine, replenishment points of products, product thresholds at vending machines, and vehicle routes for inventory replenishments are all essential challenges in vending machine system management and operation. If all facets of the problem were to be addressed,

it would require techniques such as forecasting, machine learning, data mining, combinatorial optimization and vehicle routing, among others. In the past, these approaches have been explored individually despite their intrinsic interdependence within the problem. This paper aims to help to fill in this gap and proposes a model for the optimisation of product allocation within a vending machine under the constraint of fixed restocking instances. The optimal product allocation is based on the definition of product profitability which accounts for the net revenue earned after the cost of restock, as opposed to the revenue earned until first stock-out to prevent arbitrary extension of the stock-out period. The whole approach is encompassed in the simulation-optimisation framework that utilises a Genetic Algorithm, with fitness evaluated as simulated revenue, to determine the optimal product allocation (Hanna Grzybowska, Briscoe Kerferd, Charles Gretton, S Travis Waller, Expert Systems with Applications (2020).

2.20 Universal IoT Vending Machine Management Platform

According to Srdjan vending machines have evolved from simple devices that sell individual products and provide simple services to complex devices where product and service offerings are tailored to each individual user. Following the increasing need to use a large amount of information in real-time (optimization of supply, timely updating of machines, monitoring the status of vending machines, etc), an increasing number of vending machines are connecting to the Internet and represent the IoT devices in the IoT ecosystem. In this paper, a solution for a universal IoT platform for managing vending machines is proposed. Emphasis is placed on the implementation of the control unit with an additional module for interaction with the users (Srdjan Tegeltija, Branislav Tejić, Ivana Šenk, Laslo Tarjan, Gordana Ostojić 2020 19th International Symposium INFOTEH-JAHORINA (INFOTEH) (2020).

2.21 Challenges and Perspectives of Recommender Systems in Vending Machines

According to IEEE the vending machine is an automated machine with a significantly limited range of products (snacks, beverages, cigarettes), and it also does not provide any additional information about the customer, which imposes some limitations on the predicting relevant products. In order to increase the demand for

vending products and make a profit, this paper proposes to consider how modern recommendation algorithms can be applied in this area. One of the important stages in building recommendation system is preparing data for analysis, so this paper describes an approach for grouping data by sales intensity and also considers the set cover problem (Polina S Deryabina, Valeriya M Iolshina, Angelina V Markova, Natalya V Shevskaya, Vladimir Belov 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (2021).

2.22   3D-printable electronics-integration of SMD placement and wiring into the slicing process for FDM fabrication

According to Florens Wasserfall, Daniel Ahlers, Norman Hendrich, Jianwei Zhang, Proceedings of the 27th International Solid Freeform Fabrication Symposium, 1826-1837, (2016), several approaches to the integration of wires and electronic components into almost every existing additive fabrication process have been successfully demonstrated by a number of research groups in the last years. While the pure mechanical process of generating conductive wires inside of a printed object has proved to be feasible, the design, integration, routing and generation of toolpaths is still a laborious manual task. In this paper, we present a novel approach to place and wire SMDs in a three-dimensional object, based on schematics generated by conventional PCB design tools such as CadSoft EAGLE. Routing wires in an object for FDM manufacturing requires certain knowledge about the printer's properties to meet the extruder characteristics, avoid non-fillable regions and electric shorts.

2.23   Laser-induced forward transfer of conductive screen-printing inks

According to P Sopeña, JM Fernández-Pradas, P Serra, Applied Surface Science 507, 145047, (2020), laser-induced forward transfer (LIFT), unlike inkjet printing, presents few constrains concerning ink viscosity or loading particle size. This is clearly favorable for printed electronics applications, since high solid content inks, such those of screen printing, can be thus transferred in a digital fashion. In this work we propose a study of the transfer mechanisms during the LIFT of a commercially-available silver screen printing ink. The printing of single voxels on glass through the variation of pulse energy and donor-receiver gap reveals a linear dependence of voxel volume respect pulse

energy for low energies and small gaps. The analysis of the transfer dynamics demonstrates that for the entire range of analyzed conditions the deposit takes place through bubble contact with the receiver.

2.24 Ink-Based Additive Nano manufacturing of Functional Materials for Human-Integrated Smart Wearables

According to Shujia Xu, Wenzhuo Wu, Advanced Intelligent Systems 2 (10), 2000117, (2020), the economical, agile, customizable manufacturing, and integration of multifunctional device modules into networked systems with mechanical compliance and robustness enable unprecedented human-integrated smart wearables and usher in exciting opportunities in emerging technologies. The additive manufacturing (AM) processes have emerged as potential candidates for rapid prototyping printed devices with diversified functionalities, e.g., energy harvesting/storage, sensing, actuation, and computation. However, there are few review reports about the ink-based additive nanomanufacturing of functional materials for human-integrated smart wearables. To fill this gap, herein, the recent progress in ink-based additive nanomanufacturing technologies, focusing on their capability and potential for producing wearable human-integrated devices, is reviewed. The manufacturing process integration, functional materials, device implementation, and application performance issues in designing and implementing the ink-based additively nanomanufactured wearable systems are thoroughly discussed.

2.25 Screen-printed flexible thermoelectric generator with directional heat collection design

According to Pin-Shiuan Chang, Chien-Neng Liao, Journal of Alloys and Compounds 836, 155471, (2020), a thermoelectric generator (TEG) was fabricated on a flexible substrate by screen printing and pressured sintering techniques for low-temperature heat harvesting applications. The screen-printed Bi-Sb-Te (p-type) and Bi-Se-Te (n-type) films that are sintered at 345 °C under a pressure of 25 MPa show the

respective thermoelectric power factor of 14.3 and 8.4 $\mu W/cm \cdot K2$ at room temperature. A planar TEG made of three pairs of Bi-Sb-Te and Bi-Se-Te thermoelements delivers an output power of 50 μW at a temperature difference of 54.9 °C. The flexible TEG shows no electrical degradation after 1000 cycles of bending in the longitudinal and transverse directions of the thermoelements. A directional heat collection design is proposed to maximize the heat supply area of planar TEGs. The fabricated TEG can attain a maximum output power density of 58.3 $\mu W/cm2$ under a temperature difference of 5.7 C with a graphite heat transmission layer attached to a heat source at the temperature of 39.8 °C. It can serve as a self-sustained power source for wearable electronics and sensing devices by harvesting thermal energy from environment or human body.

Table 1

Synthesis Matrix

	Source 1	Source 2	Source 3	Source 4	Source 5	My Thoughts
Title **Author(s)** **Year** **Discipline**	Vending machine foods: evaluation of nutritional composition, António Raposo et.al, 2016	Smart Coffee Vending Machine Using RFID, ISSN, 2017	Water Vending Machine, Navlakha et.al, 2017	Drinking water quality of water vending machines, Parit Raja et.al, 2016	Preserving fresh fruit quality by low-dose electron beam processing for vending distribution channels, Biance Smith et.al, 2020	
Main Idea 1 **Food and Beverage Vending Machine**	The nutritional quality of vending machine foods may be a factor that contributes to significantly increase obesity and associated	The vending machine which provides the beverage like snacks, cold drink, it is also used for ticketing. These systems are operated on either coin or	Nowadays water vending machines are available and operated on only one coin but our aim is to design water vending machine which is operated on	An increased in demand from the consumer due to their perceptions on tap water quality is identified as one of the major factor on why they are	Food vending is estimated to be a $20 billion industry in the United States. There is an untapped business opportunity to positively influence	It instantly provides food and drinks. Vending machine provides foods and beverages that are ready to be

diseases, and the vending industry is significantly growing worldwide. This study aims to evaluate the nutritional composition of vending machine foods and to compare it with the consumption of the Gran Canaria population. Food products from 74 snack and 71 refrigerated vending machines located in Las Palmas (Gran Canaria), and on university campuses,	note or manually switch operated. This paper presents system which operates not on coin or note, it operates on RFID system. This system gives the access through only RFID which avoid the misuse of machine. A small RFID reader is fitted on the machine. The identity card which contains RFID tag is given to each employee. According to estimation the numbers of cups per day as per client's	different coins. In India there is problem of safe drinking water therefore we are going to provide mineral water. Water has become the most commercial products of the century. This may sound bizarre, but true. The stress on the multiple water resources is a result of a multitude of factors. On the one hand, the rapidly rising population and changing lifestyles have increased the need for fresh water. If	mentally prepared to pay for the price of the better quality drinking water. The thought that filtered water quality including that are commercially available in the market such as mineral and bottled drinking water and from the drinking water vending machine makes they highly confident on the level of hygiene, safety and the mineral content of this type of drinking water. This study was investigated the vended water	nutrition and health by positioning fresh fruits and vegetable items as healthy vending items in vending machines. The hypothesis was that low dose (≤1 kGy) electron beam (eBeam) processing, alone or, in combination with Modified Atmosphere Packaging (MAP) is effective for developing fresh produce-based vending items. Shelf-life, sensory attributes, and	consumed by the buyers. When you are going to purchase from a vending machine, you so not have to get spoon and stir your coffee.

were nutritionally assessed. The percentages of sales per food type were accessed during a 12 month-period to verify user preferences. Significant differences (p < 0.05) were found in the content of nutrients compared with the Kruskal-Wallis test with all the food groups. Sandwiches (wholemeal and white bread) had the lowest energy levels, while	requirement are programmed. Then an employee goes to vending machine show his card to the reader then the drink is dispensed. But when employee wants more coffees than fixed number, that person is allow for that but that employee has to pay for extra cups and amount is cut from the salary account.	opportunity costs were taken into account, it would be clear that in most rural areas, households are paying far more for water supply than the often-normal rates charged in urban areas. Also, if this cost of fetching water which is almost equivalent. To 150 million women days each year, is covered into a loss for the national exchequer, it translates into a whopping 10 billion rupees per year.	quality from the drinking water vending machine in eight locations in Parit Raja are in terms of pH, total dissolve solids (TDS), turbidity, mineral content (chromium, arsenic, cadmium, lead and nickel), total organic carbon (TOC), pH, total colony-forming units (CFU) and total coliform. All experiments were conducted in one month duration in triplicate samples for each sampling event. The results indicated	consumer acceptability are key metrics for healthy vending items. The experimental objectives were to evaluate low dose eBeam (≤ 1 kGy) processing alone or along with MAP for red grapes, cherry tomatoes, and strawberries for reducing bioburden, while maintaining sensory attributes and consumer acceptability scores. The eBeam treatment at $\leq$	

	croissants had the highest.			the TDS and all heavy metals in eight vended water machines in Parit Raja area were found to be below the Food Act 1983, Regulation 360C (Standard for Packaged Drinking Water and Vended water, 2012) and Malaysian Drinking Water Quality, Ministry of Health 1983.	1 kGy alone, or in combination with MAP suppressed bioburden by at least 1 to 2 log units over 21 day refrigerated storage as compared to untreated control samples.	
	Source 1	**Source 2**	**Source 3**	**Source 4**	**Source 5**	**My Thoughts**
	An (un)healthy poster: When environmental cues affect consumers' food choices at vending machines, Stöckli et.al,	The impact of buyer-supplier relationship quality and information management on industrial vending machine benefits in the	Promoting healthy choices from vending machines: Effectiveness and consumer evaluations of four types of interventions, Colin Bos et.al	Impact of total vending machine restrictions on US young adult smoking, Mike Vuolo et.al (2016)	Testing product, pricing, and promotional strategies for vending machine interventions with a college population, Morgan F	

	2016	healthcare industry, John F.Kros et.al (2018)	(2018)		Sowers et.al (2019)	
Main Idea 2 **Vending machine benefits in the healthcare industry**	There is growing evidence that environmental cues influence how much one consumes. This article demonstrates that environmental cues can similarly impact the healthiness of consumers' food choices. Two field studies examined this effect with consumers of vending machine	Despite the calls for a deeper understanding of SCM in the healthcare industry, theoretical research focused on healthcare buyer-supplier collaboration, specifically inventory management issues, remains nascent and fragmented. Although slow to change, healthcare organizations have begun to consider	Vending machines often provide relatively energy-dense snack foods and beverages at a wide variety of points-of-purchase. Vending-machine interventions that stimulate low-calorie choices can therefore play a role in improving the healthfulness of the food environment landscape. The aim of this	They found that total vending machine restrictions decrease any recent smoking (OR = 0.451; p < .01), net of other covariates. Though the passage of a restriction does not alter an individual's smoking over time, living longer in an area that has a restriction lowers the propensity that an individual will smoke at all (OR = 0.442; p < .05). We find no	Vending interventions among college students may be improved by incorporating identified influential attributes for product, pricing, and promotional strategies. Participants' product opinion was most commonly related to taste. Participants' identified pricing levels	There are good and bad impact of having vending machine. There are people who abuse its uses. Just like the vending machine of cigarette, people who smoke are more encourage because of it. And to junk foods which is unhealthy for everyone's

foods who were exposed to different posters. In field study 1, consumers with a health-evoking nature poster compared to a pleasure-evoking fun fair poster or no poster in their visual sight were more likely to opt for healthy snacks. Consumers were also more likely to buy healthy snacks when primed by an activity poster than when exposed to the fun fair poster. In field	alternative inventory management systems to improve inventory control and patient care. Industrial vending machines (IVM) can help healthcare organizations address inventory management issues. Grounded in transaction cost economics and contingency theory, this research develops and empirically tests a model that highlights the critical role of information	study is to examine the effects of four vending-machine interventions, varying in level of intrusiveness, on consumers' choices, consumers' acceptance of such interventions, and consumers' evaluations of the choice they made.	effect of total vending machine restrictions on smoking a pack daily. Total vending machine restrictions appear to be an effective, yet highly underutilized, means of tobacco control.	were based on perceived healthfulness, affordability, and payment convenience. The highest scoring promotions were described as having simple, clear health information and a visually appealing design. The majority of participants surveyed (70%) indicated they would purchase the product if it were in the vending machines on campus. However, 60% of participants	health. But there are still vending machine that helps the health care industry such as vending machine of medicine, alcohol, tissue and etc.

	study 2, this consumer pattern recurred with a poster of skinny Giacometti sculptures.	management in the link between buyer-supplier relationship quality and performance outcomes within the context of IVM implementation and use in the healthcare industry.			used vending machines less than once per month, with the most common reasons for vending use being hunger (38%), lack of time (30%), and convenience (30%) and the most common reasons for vending product choice being price (20%), health (20%), taste (15%), and cravings (15%)	

	Source 1	Source 2	Source 3	Source 4	Source 5	My Thoughts
	Vending Machines: A Narrative Review of Factors Influencing Items Purchased, Sophia V. Hua, MPH (2016)	Recent advances in printable thermoelectric devices: materials, printing techniques, and applications, Toni P Pasanen et.al, 2020	Compatibility of 3-D printed devices in cleanroom environments for semiconductor processing, Toni P Pasanen et.al 2019	Solar Powered Reverse Trash Vendo Machine, Alexis John M Rubio et.al, 2016	A simulation-optimisation genetic algorithm approach to product allocation in vending machine systems, Hanna Grzybowska et.al, 2020	
Main Idea 3 **Vending Machine**	Vending machines are a ubiquitous part of our food environments. Unfortunately, items found in vending machines tend to be processed foods and beverages high in salt,	Thermoelectric devices have great potential as a sustainable energy conversion technology to harvest waste heat and perform spot cooling with high reliability. However, most of the	3-D printing has potential to revolutionize manufacturing of customized low-cost scientific equipment, and numerous self-designed applications have already been realized and demonstrated.	Solar Powered Reverse Trash Vendo Machine aims to encourage people to engage in recycling and to diminish the practice of improper waste disposal in the Philippines. The device used a Gizduino X	The optimization of logistic vending machine systems is decidedly complex. Product allocation to columns in a vending machine, replenishment points of	A vending machine consists of simple electro-mechanical systems which help to automate the entire vending process. It is a standalone

sugar, and/or fat. The purpose of this review is to describe intervention and case studies designed to promote healthier vending purchases by consumers and identify which manipulations are most effective. All studies analyzed were intervention or case studies that manipulated vending machines and analyzed sales or revenue data.	thermoelectric devices use a toxic and expensive material, which limits their application. These materials also require high-temperature fabrication processes, limiting their compatibility with flexible, bio-compatible substrate. Printing electronics is an exciting new technique for fabrication that has enabled a wide array of biocompatible and conformable systems. Being able to print	However, the applicability of 3-D printed devices to cleanrooms used for semiconductor processing is not as straightforward, as the controlled environment sets strict requirements for the allowed materials and items.	ATMega 1281 as its main processing module along with a Gizduino 644 microcontroller board, and a GSM Shield module for communication. Arduino1. 6 IDE is used to program the Gizduinoboards. The device is powered by a 15V rechargeable battery, which is charged by a solar panel retrofitted at the roof of the device, this is to promote energy conservation, and green engineering principles in the development of	products, product thresholds at vending machines, and vehicle routes for inventory replenishments are all essential challenges in vending machine system management and operation. If all facets of the problem were to be addressed, it would require techniques such as forecasting, machine learning, data mining, combinatorial optimization	unit which requires a standard power supply connection to function.

This literature review is limited to studies conducted in the United States within the past 2 decades (ie, 1994 to 2015), regardless of study population or setting.	thermoelectric devices allows them to be custom made with much lower cost for their specific application.		the study. The device can process empty plastic bottles (500ml. max) with a base diameter of 3.5 inches, and aluminium cans. These recyclable materials are placed inside the machine and is scanned, then crushed and placed in a bin.	and vehicle routing, among others.

2.1 Synthesis of the Study

A vending machine is an automated machine that provides items such as snacks, beverages, cigarettes and lottery tickets to consumers after cash, a credit card, or a specially designed card is inserted into the machine. An automated machine which is intended to provide the users with a diverse range of products: snacks, beverages, pizzas, cupcakes, newspapers, tickets, etc. A vending machine dispenses a product to the users based on the amount of money inserted and selection of the product. Vending machine is a 24x7 standalone unit which requires a standard power supply connection to function. It consists of simple electro-mechanical systems which help to automate the entire vending process. In a

nutshell, its basic function is to flawlessly issue users with a diverse range of products anytime.

2.2 Concept of the Study

The concept of the study is that it will no longer use desktop, the best desktop to use is cellphone that will scan the QR code place on the raspberry. After scanning the QR code on raspberry, its web ui will appear where you can browse the file and upload it for printing. It has a modal for printing option which selects whether colored or grayscale and how many pages you want to print. Before printing the file, the credits/amount will appear. The button cannot be pressed until you have dropped the exact amount into the coin slot.

2.3 Definition of Terms

- **Microcontroller** - is a computer-on-a-chip used to control electronic devices.
- **Raspberry Pi** – is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom.
- **Coin-** Is a piece of hard material that is standardized in weight, is produced in large quantities in order to facilitate trade, and primarily can be used as a legal tender token for commerce in the designated country, region, or territory.
- **Coin slots-** A coin receptacle on a vending machine.
- **Ink**- liquid or paste contain pigments and/or dyes and is used to color a surface to produce an image, text, or design. Ink is used for drawing and/or writing with a pen, brush, or quill.
- **Memory**- Refers to the physical devices used to store programs (sequences of instructions) or data (e.g. program state information) on a temporary or permanent basis for use in a computer or other digital electronic device.
- **Power Cord**- a cable that temporarily connect an appliance to the mains electricity supply via a wall socket or extension cord.
- **Printer**- Is used to print anything that you want, like pictures or documents or data. They plug in where there is a USB slot, from there you can click print and the document is sent to the port where your document is printed.
- **Prototype-** An original model which something is patterned.