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Best Devices to Replace Laptops at Intel

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Portland State University

Maseeh College of Engineering and Computer Science

Department of Engineering and Technology Management

ETM 530/630 – Decision Making Winter

Spring 2018

Individual Project Paper

BEST DEVICES TO REPLACE LAPTOPS AT INTEL

AAYUSHI GUPTA

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ABSTRACT

With the rapid technology changes in today's world companies that depend on technology need to strategically choose and plan their technology path in order to maintain competitive advantage and avoid any future problems. In this case we have a popular company i.e. Intel Corporation, that provides its employees with a variety of laptops to choose from. We on the other hand, are going to let them choose from the new and advanced Tablets and notebooks so as to provide ease to the employees. We are doing this so as to give more new products available in the market to the employees of Intel Corporation and as it is a big brand name , new and advanced products should be available for its employees too.

We assessed the company's expectations and did device and gadgets research in order to meet company expectations and find the best possible solution for the give situation. We have identified major orientations of Intel corporation and four possible alternatives (options), that we will explore using pair-wise comparisons. Intel intends to replace their current laptops for employees with anew and easy to carry products. This is going to span through the next couple years and making the right decision is imperative. Due to the variety of the devices and gadgets available in the market, we will go through a decision-making process in selecting the appropriate platform while keeping in mind the needs and wants of the company.

The analysis showed us that one of the device was best fit for the company and people would be excited to use it. The experts weighted each criterion and the result is shown in the results.

TABLE OF CONTENTS

This Page Intentionally Blank 2

ABSTRACT 3

INTRODUCTION 1

METHODOLOGY OVERVIEW 5

Selecting a Decision Model 6

Definition of the Decision Problem: 8

SELECTING & VALIDATING HDM PERSPECTIVES AND CRITERIA 9

Level-1 Perspectives 9

Level-2 Decision Criteria 10

Performance 12

Value 12

Features 13

Job Areas 13

DATA SOURCES FOR MODEL QUANTIFICATION 20

Quantification Process 20

KEY FINDINGS AND ANALYSIS 21

FUTURE RESEARCH 23

REFERENCES 25

APPENDIX A: FINAL QUANTIFIED MODEL – HIERARCHICAL DIAGRAM 28

APPENDIX B– INDIVIDUAL PERSPECTIVE 28

INTRODUCTION

The purpose of this project is to replace the laptops for intel employees and provide them with the more handy and new technologically advanced devices like tablets, chrome books and surface pro. As Intel is a vast organization, this decision would be based on the type of devices that would suit each department of Intel and prioritize them through use of multiple-criteria decision analysis (MCDA) methods and subject matter expert (SME) assessments. This project basically selects a device suitable for the intel employees by the senior management or the top-level management so as to use the new technological products in the company. In today's world, Company laptops are a boon in business world as they allow employees to work remotely and outside of normal working hours. There are several factors which are need to be considered, however, to determine if buying laptops for everyone on your team is within your budget [14]. With some good reasons, more and more businesses are turning to tablets [15]. Tablets are also superbly powerful business tools, which is why more and more businesses are turning to tablets for their everyday IT needs. By 2016, 30% of all enterprise end-user mobile computing devices will be tablets, and corporate purchases will account for 18% of the global tablet market [15]. Cost is a factor, of course: tablets' low purchase price makes them attractive, and their ease of use means they reduce support and training costs too. But the biggest benefit to businesses is in increased productivity.

INTEL'S BACKGROUND

Figure 1: Intel Logo

As with the technological advancement in the coming years, there is a need for the companies to change their products. The company chosen in this report is Intel Corporation. Intel Corporation is an American multinational corporation and technology company headquartered in Santa Clara, California, in the Silicon Valley [1]. Intel supplies processors for computer system manufacturers such as Apple, Lenovo, HP, and Dell; and also manufactures motherboard chipsets, network interface controllers and integrated circuits, flash memory, graphics chips, embedded processors and other devices related to communications and computing [1]. It is the world's second largest and second highest valued semiconductor chip makers based on revenue after being overtaken by Samsung and is the inventor of the x86 series of microprocessors, the processors found in most personal computers.

DECISION PROBLEM

We assume that Intel operates in three areas: Software and IT, Sales and Marketing and Business Administration. They currently might incorporate about 10,000 laptops that play an important role in everyday operations. Processing information is a high priority since lives could be at stake. They would like devices that will be capable of being used in all the three areas without making major sacrifices to the system performance or life expectance. The organization is looking to

strategically choose the devices that will allow the corporation to reduce cost and have a quality maintain their reputation. There are many factors to be considered in the selection process. We will have experts in this field (some from Intel and some basic experts) to select the appropriate devices in order to meet their corporate mission.

This project seeks to choose from four alternatives provided to different employees of Intel Corporation in Portland, Oregon. After examining the existing gadget or device market we have narrowed down our choices. The range of alternatives chosen belong to a similar range in terms of price, speed, processors and some features but the difference lie on the opinion of the expert, the different departments in Intel and based on the other criteria's given.

SCOPE AND TECHNOLOGICAL ADVANCEMENTS

In this advancing world of technology, wireless mobility is impacting business and home users by changing the way we work and live. Research studies have modeled the patterns of use in ubiquitous computing environments. [2]

Intel studied more than 100 Intel employees in different offices around the United States, to study how wireless enabled laptops impact productivity and work behavior, by providing them with the same Intel Centrino mobile technology notebook bundles used in their migration. Intel began migrating users from Intel® Pentium® II processor-based notebook bundles to Intel® Centrino ^TM mobile technology-based notebook bundles in 2003 [2]. They were surprised that though there was the pace at which the participants' work behaviors changed during the study.

They observed a productivity gain of 37.3 percent between the two systems which confirmed their business decision to migrate to wireless technology. This was done by testing participants in Intel's Human Factors Engineering Usability labs, gathering data from weekly activity logs kept by study participants, evaluating responses to pre- and post-surveys, evaluating actual usage patterns from the records of wireless hotspot access service providers, and conducting one-on-one interviews with study participants [2].

The lightweight personal computers which are quickly gaining popularity are called Notebook (also called laptop) computers. The lighter weight and increased battery life has made the use of notebook computers more commonplace. [3] The popularity of the notebook computers has especially increased since their prices have been dropping significantly, while maintaining similar performance as their larger siblings i.e. desktop computers or workstations.

Aside from size, a major difference between notebook computers and personal computers is the graphical display system. The ease of portability is one clear advantage of notebook computers. Notebook computer designers employ a variety of techniques to produce lightweight graphical display systems [3].

Today tablets are one of the most innovative and sought-after electronic devices on the market although they did not exist five years ago. There are many articles that highlighted the kinds of features possessed by the next-generation tablet computers [4]. Applications are revolutionizing the consumer electronics market, and tablets have been a central part of that revolution. The revolution of the tablets has led to a more easy and accessible way of working and time shifting which refers to the worker's ability to distribute time around work and personal obligations and shift their work times as needed to reduce times of low or no productivity [2].

METHODOLOGY OVERVIEW

This section gives the idea of the research methodology used for this project. Detailed information about how each step was approached and completed is explained in the section below. The decision model methodology was done via following these steps, listed as follows:

1. **Defining the decision problem:**

   After selecting the topic i.e., laptop replacement for Intel employees, a decision was made to approach the decision problem from the combined perspective of experts in different fields and mostly of the same organization (Intel Corporation). Additionally, a research was conducted into the development process, including the proposed timeline, project requirements and potential participants. Finally, in this initial step, these research questions were tested using the decision model.

2. **Selecting decision modeling methodology:**

   Upon reaching on to the research question and a broad definition of the decision problem, a literature review of the hierarchical decision model (HDM) is followed in the process of developing the decision model in this study.

3. **Selecting initial criteria, sub-criteria and alternatives:**

   The meaning of this step was to take the defined decision problem and bring in some specific set of alternatives (options) and an initial set of perspectives and criteria and sub-criteria's. A research was done on the set of criteria's and some perceptive were set. To test the research questions, the set of alternatives were carefully chose so that we can compare it in a good way.

4. **SME feedback for validation:**

   A feedback was taken from the knowledgeable experts who have an expertise in these fields and are aware of the organization. The roles and responsibilities make them ideally suitable to assess the four options and help set a direction that stands to influence the choice of which gadget to choose for the employees

5. **Completing the model:**

   After the model validation, the input was considered and changes were incorporated. After the final analysis of the criterion and the alternatives, the model is developed and the expert panel is involved further to conduct pairwise comparison in each level of the model. The study will present the final calculations on the weightings of each criteria and alternative given by the experts.

6. **Process data, analyze and develop conclusions, address research questions.**

7. **Develop future research recommendations.**

   The study was further discussed in the future recommendations with the literature review and how this topic has spread in different fields and various ways and applications.

Selecting a Decision Model

The hierarchical decision model(HDM) is a multi-criteria method that allows to model complex problems in a hierarchal structure. HDM was developed by Prof. Dundar F. Kocaoglu in 1979 using a pairwise comparison scale and judgmental quantification technique(Kocaoglu,1998). Later, he developed a more general form of the HDM, with Dr. Cleland in 1981 which consisted of Five hierarchical levels as Mission, Objectives, Goals, Strategies and Action. These levels are flexible to

be incorporated and related to the requirements of any cases under study. Also, the complexity of the decision problem is determined by the number of hierarchical levels.

When following the hierarchical decision modeling, the problem under study is first decomposed into a hierarchy of levels to be easily comprehended and analyzed independently. Each level in this hierarchy will comprise of decision elements, which relates to any aspect of the problem under study. The decision elements in each level are connected to decision elements that reside on the levels above and below. The objective is always placed at the top of the hierarchy followed by the criteria and the sub-criteria in the second and third levels respectively. The potential alternatives reside at the bottom of the hierarchy. Additionally, this method also implements several techniques to analyze the data acquired during the judgement process.

These techniques are judgement quantification, pairwise comparisons, inconsistency, disagreement analysis, sensitivity analysis, desirability curve and HDM validations. Overall, this method is an effective way that assists decision makers to break down the problem in a simpler way and also assists in synthesizing a large amount of information at different scales along with converting the judgments into data for that allows quantitative decision makings in different fields. In this study, the HDM decision model will be used with judgement quantification, pairwise comparison, inconsistency and disagreement analysis.

Each outcome was evaluated against each sub criteria. Since each item is compared numerically, it was also necessary to define what a high number meant, as it could have a direct or inverse relationship to a high value of the sub criteria. For example, if something is low risk, it would be ranked as a high number because lower risk is a good thing.

The decision, perspectives, sub-criteria, and outcomes were placed in a hierarchy as a node and the Portland State University HDM web-based software was used to analyze the model. The software presents the model as shown in Figure 2. To evaluate the model, the expert changes their preference towards each pair of nodes in relation to the node it is connected to above it.

The scale is from 1 to 99. A weighting of 50/50 represents that the two nodes are equal. After all experts evaluate the model, the results are aggregated to show the mean, standard deviation, and overall disagreement. The inconsistency of each expert is also examined. Values of 10% or less are acceptable for both disagreement and inconsistency [16].

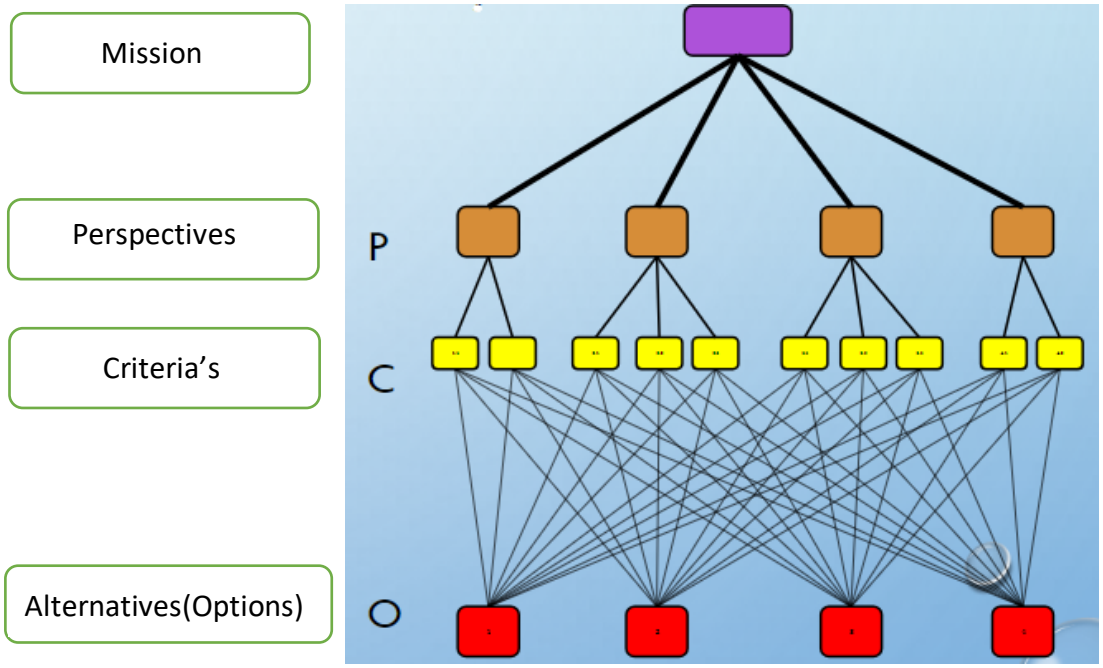


Figure 2: Basic HDM tool structure

Definition of the Decision Problem:

Decision Matrix and Pairwise Comparison are the two tools that are used in this report in order to assess the relative merits of different devices. The decision-making process involves many criteria that is desired by the corporation and the board of directors doesn't have enough information or

experts in this field in order to make this decision. Making a decision would include putting aside a significant amount of resources to the selected device and making a choice that would not be disastrous to meet the company's expectations. This is why the Intel has selected some experts in this area, to help with the decision-making process. While gathering the information on the decision-making problem it was examined that the possible decision-making models could be implemented in order to find the best possible solution. As more information was gathered I observed that there are multiple options and weighted expectations from the desired alternatives selection so in order to take the desired preferences, a pair-wise comparison model was developed that seemed to fit perfectly for this situation. In addition, the decision matrix created could be used universally under different constraints provided by the organization. The steps to perform the pair-wise comparison are also included as part of the literature to the experts, following which, each of the experts would click on every node in the model and then compare each of the two criteria by assigning a value say n which lies between 1 and 99 to one of them and the software would assign a value, 100-n to the other criteria. In this way, the experts completed the pair-wise comparison on all the nodes of the model. The data submitted by all the experts are collected to perform the analysis and quantification of the HDM model.

SELECTING & VALIDATING HDM PERSPECTIVES AND CRITERIA

Level-1 Perspectives

Taking these examples as a starting place, modifications were made to adapt the perspectives to this instance. A comprehensive literature search is performed on the decision elements so that

the experts could be provided with all the information related to the criteria, sub-criteria and alternatives for them to deliver their comparison and judgements.

The initial model made had just three perspective which were: Performance, Value and Features. Later, consulting with the expert resulted in one more perspective as Job areas in which it tells which device would be suitable to which department, and this was made clearer. The final perspectives are: Performance, Value, Feature and Job areas.

Level-2 Decision Criteria

After initial sub criteria were created for each perspective, the review by experts resulted is several changes and additions to the model, as shown in Figures below.

Figure 3: Model before validation

This model which was created initially did not have the job area specification section but after validating it from few experts it made more sense to give a particular job specification to the type

of device to be chosen. So instead of providing all the job areas, we broadly classified them into three section and took it as a criterion with the various departments as sub-criteria's.

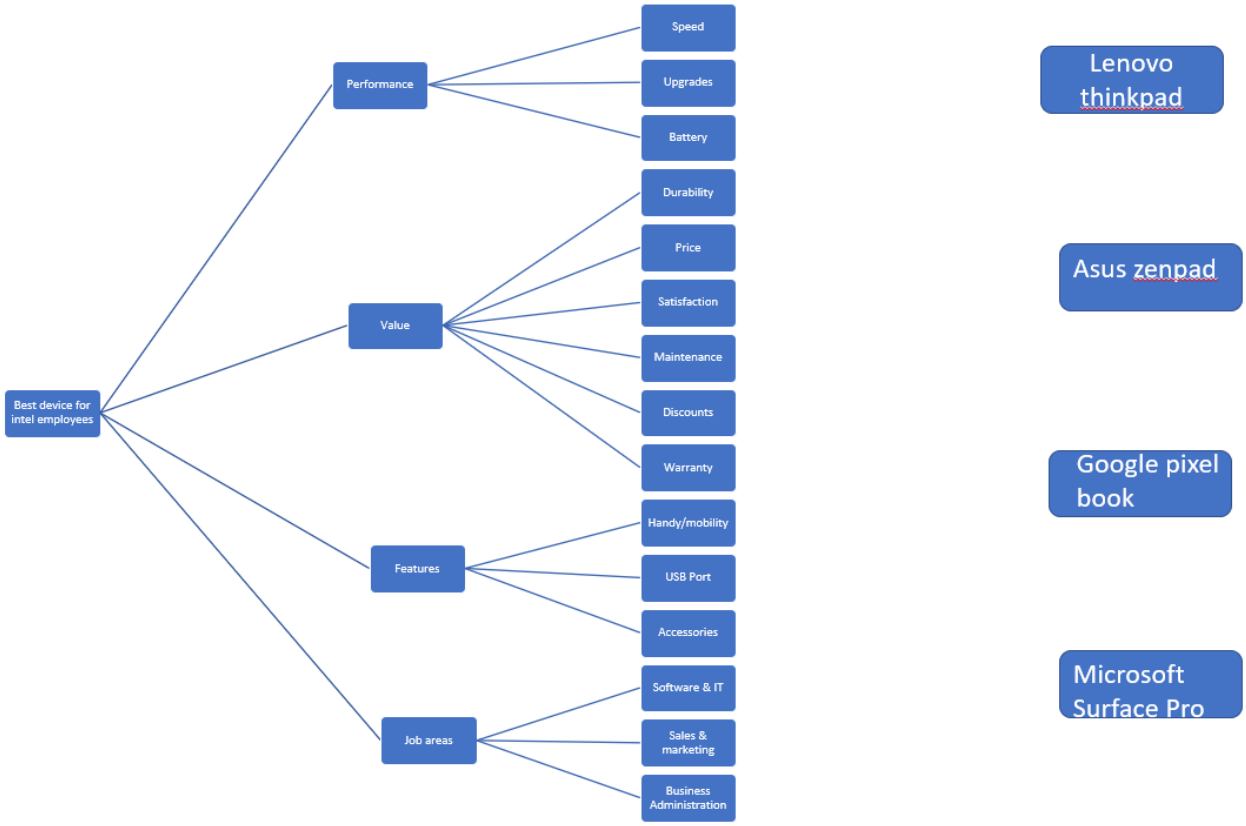


Figure 4: Model after evaluation

After validating the model from the experts, few changes were done like the USB port shifted to the features criteria from the performance factor. Then another sub-criterion was added under value i.e., discount. The warranty moved from features section to the value criteria as well.

Performance

This perspective talk about the performance of the devices to choose from. Three evaluation criteria fell under the objective of performance. Speed in which the device can perform, based on the different field the speed of the device requirement would be different. Then next would be upgrades, which would be like the upgrades or the new software updates or the upgrades in the devices provided by different alternatives. The third criteria is battery, which is comparing the battery life of the devices so that it does not have to be changed again and again and how long it lasts so that the employee doesn't need to worry about charging it every time.

Value

The value perspective tells that how much value does that device hold and that effects the customer to buy. Six criteria's fall under this perspective. The first is the durability, which shows whether it is long lasting so that the company doesn't worry about changing their products again and again. Price is the second criteria which is simple which one gives the best result in the reasonable price, though the prices of alternatives fall in the same range but there is still a minor difference. The third criteria is the satisfaction factor, which depends up to the satisfaction of the employee and the company itself. Next is the maintenance which is like the technical support required when the device needs repairing or maintenance. The fourth criteria is discount, as the company would buy the devices in bulk so the little discount provided by the device companies. Warranty is the next criteria, which is like the written agreement by the gadgets company to give repairs and replacements if needed over a particular time.

Features

The features perspective talk about the additional features provided by the devices that would be more attractive and apt to the requirement of the company. Three criteria's fall under this category. First talks about the handy/mobility or the ease of carrying the device. The next is the USB port which gives the ease of transferring the material or avoiding USB port so as to make the design sleek and easier to use. The last one that falls in this category is the accessories which will be available with the device as in keyboard, mouse, the stylus or the bag to carry it in.

Job Areas

This perspective is mostly broad definition of departments in intel and we decide which device would be suitable for that department. We are categorizing into three job areas. First is the Software and Information Technology, that department may want a device with much higher processing speed or a have more different technical requirement than the other departments. The second job areas would be Sales and Marketing, which would like their device to be more handy and easy going one as per their work. Business Administration covers all the legal and corporate affairs department and would like to have handier device.

The full list of criteria definitions, as provided to SMEs for reference during model quantification is provided in Figure below.

Perspective	Decision Criteria	Description
Performance	Speed	Comparing the speed of the different gadgets appropriate for their work

	Upgrades	the upgrades or the new software updates or the upgrades in the devices provided by different alternatives
	Battery	Comparing the battery that how long it can survive so that the company doesn't need to change it much and person doesn't have to carry the charger everywhere
Value	Durability	The design level of buildings and infrastructure to withstand a design event and remain occupiable and operational. Buildings designed to life safety standards will be severely compromised in a design event.
	Price	The extent to which water, wastewater, electricity, and heating and cooling services will be available to occupants and the wider community following an interruption caused by a disaster event. The disruption may last for an extended period of time.
	Satisfaction	The extent to which community organization structures exist that have the ability to take action in a disaster event.
	Maintenance	The technical or the service and the support from these different companies so that they won't need to worry about the maintenance of their products
	Discounts	What level of discounts would these brands offer as intel is going to buy in bulk for its employees
	Warranty	the written agreement by the gadgets company to give repairs and replacements if needed over a particular time
Features	Handy/Mobility	According to the new technological advancements, how much ease would it provide to the intel employees in terms of having their gadgets on their side almost every time

	USB Port	The ease of transferring the material or avoiding USB ports will give them more sleek design
	Accessories	The keyboards and the mouse or the bag to handle that gadget or the extra accessories would be provided or not
Job Areas	Software & IT	the software or IT people may have different technical expectation from their device or requirement of different processor susceptible to that device
	Sales & Marketing	the sales and marketing or other such department would need handier but easy-going device rather than what software people have
	Business administration	All the HR and legal and corporate affairs department or such would need another device that fit their requirements

Table 5: Description of Criteria's

ALTERNATIVES

The alternatives or substitutes that are considered in this study are Lenovo ThinkPad t470 business laptop, Asus Zen pad Z10, Google Pixel book and Microsoft Surface Pro.

1.Lenovo ThinkPad t470 business laptop

- PROCESSOR- Up to 7th generation intel core i7-7600U Processor (4MB Cache, up to 3.90GHz)
- OPERATING SYSTEM- Windows 10 home-Lenovo recommends windows 10 pro
- GRAPHICS- Intel HD Graphics 620
- MEMORY-Up to 32 GB DDR4 2133MHz

- STORAGE- 500 GB 7200 RPM,Up to 1TB SSD OPAL2.0
- AUDIO-Dolby advanced audio, Stereo Speakers
- BATTERY- Up to 18 hours of battery life
- TOUCHSCREEN-Available
- Price $829.99
- DIMENSIONS-(W*D*H)- 13.25" x 9.15" x 0.79" / 336.6 x 232.5 x 19.95 (mm)
- WEIGHT- starting at ~3.48 lbs.(1.6kg)
- PORTS-3 X USB 3.0,1 x Thunderbolt 3 port (USB Type-C),3.5 mm Combo Audio jack,1 x HDMI, 1 x RJ45 Gigabit LAN, 1 x CS13 Docking, 1 x Media Card Reader (SD 3.0, UHS-I), 1 x Smart Card reader,1 x Micro SIM

2.ASUS ZenPad™ Z10 32GB In Slate Gray [12]

- Network - LTE Bands: B2, B4, B5m, B13; CA: B13+B4, B13+B2, B4+B2, B2+B5, B4+B5, B4+B4, B2+B2
- LTE Advanced - With 50% faster peak speeds in more than 450 cities from coast to coast.
- Standby Time - Up to: 56 days
- Usage Time - Up to: 20 hrs
- Camera - 8 MP
- Front Camera - 5 MP
- Weight - 17.3 oz
- Height -9.54 in

- Width -6.46 in
- Screen - 9.7” QXGA 2048 x 1536, IPS, 264 ppi
- Battery -7800 mAh
- Price-$ 318.98
- Operating System -Android Marshmallow
- Storage - 32 GB, 3GB RAM (Actual formatted capacity is less)
- Expandable Memory -Supports microSD card up to 128 GB (sold separately)
- SAR-1.25W/kg

3.Google Pixelbook 12.3" Multi-Touch 2-in-1 Chromebook (Silver) [13]

- PROCESSOR- Intel Core i7-7Y75 Dual-Core
- BASE CLOCK SPEED-1.3 GHz
- MAX BOOST SPEED- 3.6GHz
- TOTAL INSTALLED MEMORY- 16GB
- PANEL TYPE-LCD
- SIZE-12.3”
- ASPECT RATIO- 3:2
- TOUCHSCREEN -yes
- KEYBOARD- Type: Standard Notebook Keyboard

  Features: Backlight
- POINTING DEVICE- TouchPad

- DIMENSIONS(W*H*D) - 11.4 x 0.4 x 8.7" / 290.4 x 11.2 x 220.8 mm
- WEIGHT-2.45 lb(1.11kg)
- TOTAL CAPACITY- 512 GB
- SSD-1 x 512 GB M.2 NVMe PCIe
- MAX RUNTIME- 10 HRS
- WATT/TYPE- 41Wh
- OUTPUT VOLTAGE- 15VDC
- 12.3" 2400 x 1600 Touchscreen
- Integrated Intel HD 615 Graphics
- Price-$749
- USB Type-C
- Aluminum Unibody & Gorilla Glass
- Chrome OS

4.Microsoft Surface Pro FJY-00001 [11]

- Operating system- Windows 10 Pro 64-Bit
- CPU- Intel Core i5-7300U 2.60 Ghz
- Screen- 12.3’’
- Memory- 8 GB
- Storage- 256 GB SSD
- Graphics card- Intel HD Graphics 620
- Video memory- Shared memory
- Other features- No pen

- Style- Detachable
- Type-Mainstream
- Dimensions (W x D x H)- 11.50” x 7.90” x 0.30”
- Weight- 1.70 lbs
- GPU/VPU- Intel HD Graphics 620
- Video memory- Shared system memory
- Graphic Type- Integrated Card
- CPU Type- Intel Core i5 7th Gen
- CPU Speed- 7300U (2.60 GHz)
- Number of Cores -Dual-core Processor
- Core name- Kaby Lake
- Screen size- 12.3”
- Price- $799
- Touchscreen- Yes
- Display Type- Pixel Sense Display
- Resolution- 2736 x 1824

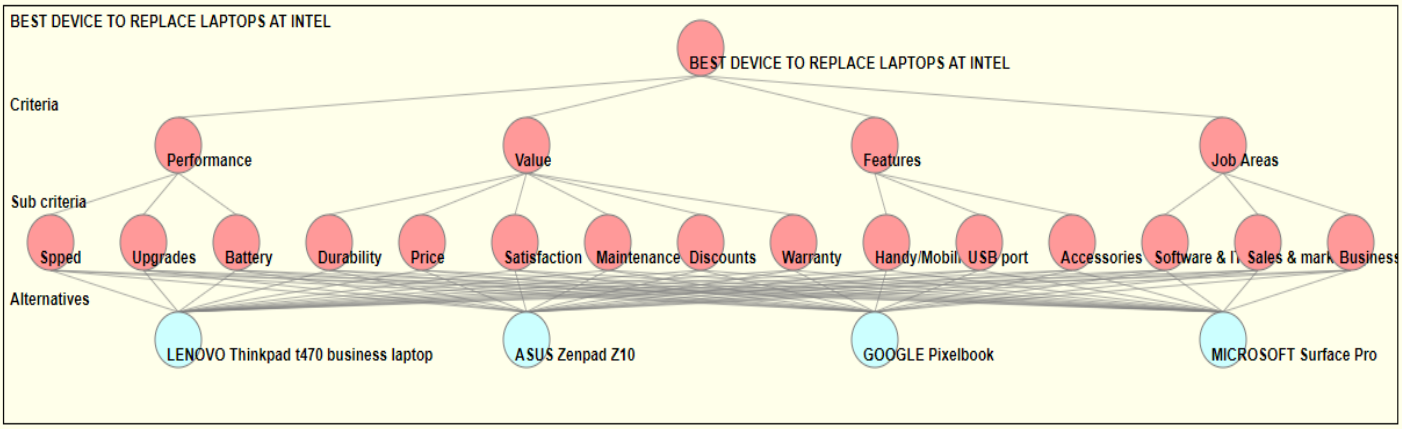


Figure 6: HDM model

DATA SOURCES FOR MODEL QUANTIFICATION

Experts

Due to the complexity of the problem in few cases which impede right decision making, additional inputs are acquired from a group of individuals belonging to different disciplines who are equipped with knowledge and experience. This group of individuals can be called the "Expert panel" (Steyeart et al., 2005). This study uses a panel of seven experts that belong to the technological field and aware of the current advancements in engineering innovations. The validation of model was done by only four experts initially but turned out to be good enough and was appreciated by other experts.The experts in this report were chosen mostly from Intel and one expert was from different company but had the area for expertise needed in this situation.

SME	Expertise & Background
1	Marketing /Head of Sales
2	Software developer/knowledge about backgrounds of a company
3	Research and development team
4	Human resource
5	Legal and corporate affairs
6	Emulation and verification
7	Manufacturing department

Table 7: Experts

Quantification Process

Experts received the ETM browser-based tool link and accompanying documentation, which included a word file with all the description of the criteria's, HDM diagram and the details about the final alternatives.

The experts were asked to become familiar with the options prior to beginning model quantification and reference the criteria definitions as necessary for clarity while performing the assessment. For some of them it was difficult as the were not familiar with the tool but in the end resulted to finally complete it in a proper manner.

KEY FINDINGS AND ANALYSIS

The results obtained from the analysis and the distribution of weights for each criteria and sub-criteria are shown in Appendix later in the report.

Experts	Lenovo ThinkPad	Asus Zen pad Z10	Google Pixel Book	Microsoft Surface Pro	Inconsistency
Expert 1	0.26	0.21	0.26	0.28	0
Expert 2	0.15	0.18	0.38	0.29	0.02
Expert 3	0.49	0.26	0.16	0.09	0.07
Expert 4	0.32	0.3	0.2	0.18	0.07
Expert 5	0.22	0.16	0.27	0.35	0.01
Expert 6	0.11	0.3	0.36	0.22	0.07
Expert 7	0.15	0.41	0.25	0.19	0.09
Mean	0.24	0.26	0.27	0.23	
Disagreement					0.084

Figure 8: Result from HDM model

After the completion of the model evaluation process by the expert panel, the data was collected and analyzed. The results obtained from the analysis and the distribution of weights for each criteria and sub-criteria are shown in the figures in this section.

The final results show that they all were totally comparable and there is very less margins between each one of them. Google Pixel book is the clear winner with a value of 0.27 and Intel should incorporate the light weighted easy to go reasonable price Google Pixel Book. However, there are additional important learnings from these results like Asus Zenpad is second and Lenovo ThinkPad at third and Microsoft Surface pro at fourth with the values of 0.26, 0.21 and 0.23 respectively. The most important criteria were found out as performance and the second was features, which were rated more than any other criteria's.

As we see broadly based on the expert opinion, Google pixel book suits best for the sales and marketing, Lenovo ThinkPad suits best for the Software and IT department; and Microsoft surface pro suits best for Business administration.

A known issue for HDM is the occurrence of inconsistency within the judgments entered by each SME across all pairwise comparisons. A 0.10 consistency level is commonly recommended as a threshold above which an individual's input is not reliable in absence of an alternate explanation. The disagreement between all the experts is also found to be less than 10% with a value of 0. 084.The F-test value between subjects is 0.18.

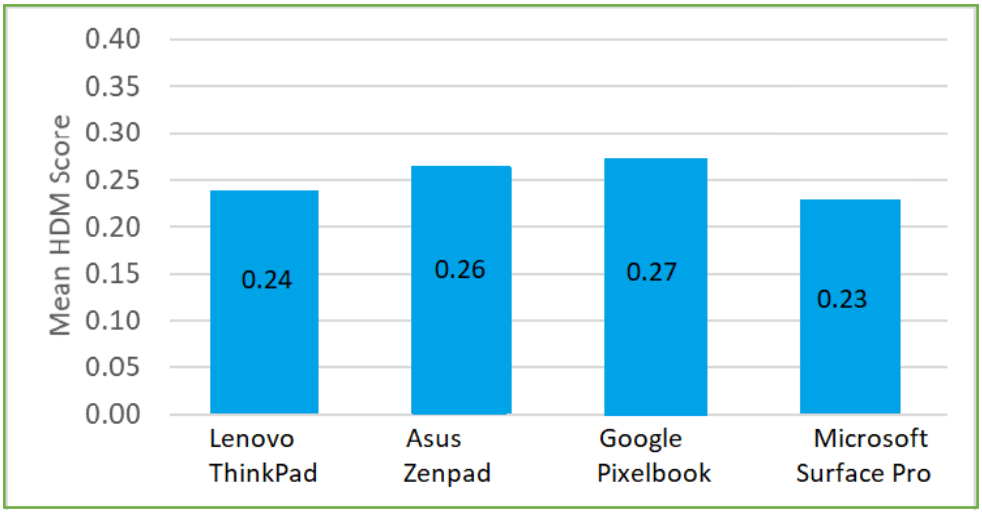


Figure 9: Mean from HDM model

FUTURE RESEARCH

This study was conducted using a robust HDM model to help Intel find better laptop replacement. In today's age of high advancements in technology, apart from the traditional personal computers in the market, we also find new and advanced notebooks and tablets, which are used for specific purposes, but have limited functionalities. Therefore, for the ease of study and also to help Intel to derive maximum functionalities, only four alternatives are considered.

With the above considerations, further research could be conducted into many fields as Use of smartphones, pocket size computers, tablets or other mobile personal computers as the main computer of computerized vehicles, is a new study coming up [5]. This will be done by connecting the smartphone/tablet/etc to the car interface, the phone/tablet/etc will become the brain of the machine, and acts as a vehicle computer system. It can be programmed for controlling/replacing many of the vehicle subsystems and accessories [5]. The same pocket size pc can replace the passengers dedicated built in computers, through the built-in monitors and keyboards provided for each seat, for Internet access, entertainment, gaming, and office works. Since gaming can slow

down the smartphone/tablet and make safety concerns, the system can be arranged to accept more than one removable processing unit in order to improve its processing capabilities.

Further studies are going on the opportunities to improve the user experience by focusing on the user rather than on applications and devices; making devices aware of their roles (both within activities and as work or personal devices); and providing lighter-weight methods for transferring information, including synchronization services that engender more trust from users [6]. Some studies have focused on the question-what is beyond laptop initiative? And have suggested the new tablets and innovative use of DyKnow Vision software and Tablet PCs [7]. Thus, the paper presents an innovative direction that engineering education may take as well as an assessment of some aspects of that direction. There have been articles on Intel's increasing efforts towards sustainability in the IT department. The article describes the choices made by Intel IT that helped it establish sustainable IT as a significant contributor to the company's sustainability efforts. [8] While significant challenges still exist, the actions taken by Intel IT, and the practical lessons learned, can be applied by other organizations seeking to leverage sustainable IT as they look to reduce the environmental impact of IT and to deliver IT-powered sustainability benefits across the enterprise [8].

Also, Consumerization of IT or Bring Your Own Device (BYOD) concept is spreading very quickly in the organizations which hugely depend on IT infrastructure and need their employees connected to the organizations computer network for most of their tasks [9]. This has resulted in enhancing ease of work in employees and is contributing in enhanced productivity. Among a lot of challenges, security is the important factor. Also, employers have to decide on working hours and payment

procedures accordingly A robust and effective decision modeling for the above-suggested studies could be made using the HDM methodology and arrive at best possible outcomes.

CONCLUSION

This report uses HDM model which is presented to evaluate the laptop replacement for intel employees. The four options: Lenovo, Asus, Google book and Microsoft surface pro, were almost exactly weighted based on the mean of seven experts feedback, with a slight leaning towards Google pixel book. Different job areas had different alternatives that suit best to that department. Lenovo ThinkPad suits best for Software and IT and Business administration, ASUS Zen pad suits best for Business administration and sales and marketing, Google pixel book suits for most of the fields particularly sales and marketing; and Microsoft surface pro suits for Business administration and software and IT. These results showed that each job area has different requirements but can use the new advanced technology of tablets and notebooks rather than traditional laptops in their workspace.

REFERENCES

[1] About Intel "Intel Corporation" [Online] https://www.intel.com/content/www/us/en/homepage.html

[2] Govindaraju, M., & Sward, D. (2005). Effects of wireless mobile technology on employee work behavior and productivity: An Intel case study. In Designing ubiquitous information environments: Socio-technical issues and challenges (pp. 349-351). Springer, Boston, MA. Chicago

[3] Ghosh, P., Thakkar, S. S., & Phan, T. V. (2004). U.S. Patent No. 6,775,129. Washington, DC: U.S. Patent and Trademark Office.

[4] Kaur, S. (2013). The revolution of tablet computers and apps: A look at emerging trends. IEEE Consumer Electronics Magazine, 2(1), 36-41.

[5] Mehrgan, B. (2013). *U.S. Patent Application No. 13/602,245*.

[6] Dearman, D., & Pierce, J. S. (2008, April). It's on my other computer!: computing with multiple devices. In *Proceedings of the SIGCHI Conference on Human factors in Computing Systems* (pp. 767-776). ACM.

[7] Chambers, Z., Chidanandan, A., DeVasher, R., Merkle, L., Minster, M., Mitra-Kirtley, S., ... & Zoetewey, M. (2006, October). What is beyond the laptop initiative? Perhaps: Tablet PCs and DyKnow Vision software. In *Frontiers in Education Conference, 36th Annual* (pp. 8-13). IEEE.

[8] Curry, E., Guyon, B., Sheridan, C., & Donnellan, B. (2012). Developing a sustainable IT capability: Lessons from Intel's journey. *MIS Quarterly Executive*, *11*(2).

[9] Afreen, R. (2014). Bring your own device (BYOD) in higher education: opportunities and challenges. *International Journal of Emerging Trends & Technology in Computer Science*, *3*(1), 233-236.

[10] Anon, (2018). [ebook] Available at: https://www.portableone.com/store/product/Microsoft-Surface-Pro-tablet-FJY-00001-Win-10-8GB-RAM-256GB-SSD-12-3-2736-x-1824-multi-touch-Intel-Kaby-Lake-i5-clone.html [Accessed 6 Jun. 2018].

[11] Anon, (2018). [ebook] Available at: https://www.amazon.com/Zenpad-ZT500KL-Android-Marshmallow-Verizon/dp/B0721BSYFM [Accessed 6 Jun. 2018].

[12] Anon, (2018). [ebook] Available at: https://www3.lenovo.com/us/en/laptops/thinkpad/thinkpad-t-series/ThinkPad-T470/p/22TP2TT4700 [Accessed 6 Jun. 2018].

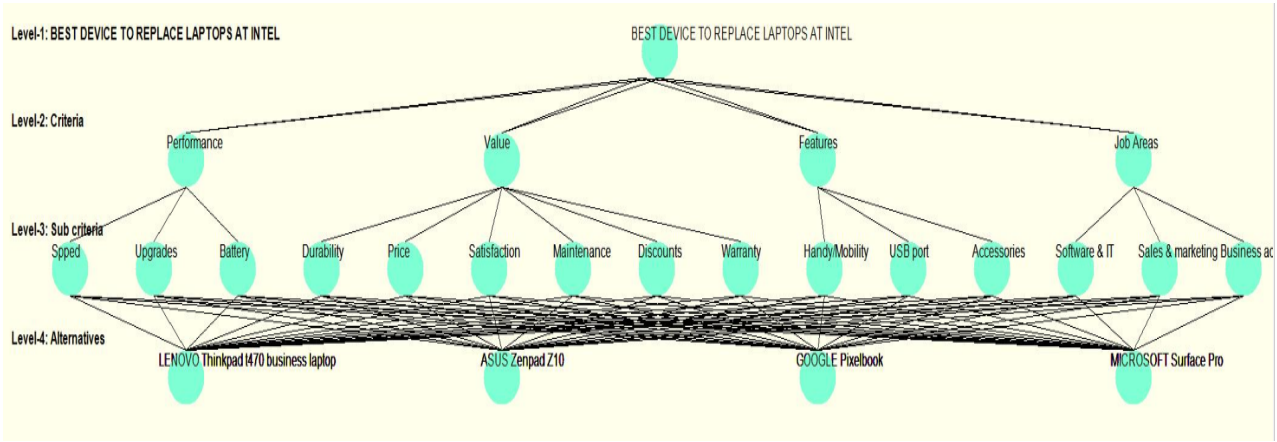
[13] Anon, (2018). [ebook] Available at: https://www.amazon.com/Google-Pixelbook-i5-RAM-128GB/dp/B075JSK7TR [Accessed 6 Jun. 2018].

[14] Anon, (2018). [ebook] Available at: https://www.allbusiness.com/pros-and-cons-buying-employees-company-laptops-23653-1.html [Accessed 6 Jun. 2018].

[15] Anon, (2018). [ebook] Available at: https://www.techradar.com/news/mobile-computing/tablets/tablets-what-are-the-business-advantages-1192794 [Accessed 6 Jun. 2018].

[16] R. Neshati, “Lecture 3 – Multicriteria Decision Modeling and AHP,” Portland State University. Jan 29, 2018. Lecture.

APPENDIX A: FINAL QUANTIFIED MODEL – HIERARCHICAL DIAGRAM



APPENDIX B– INDIVIDUAL PERSPECTIVE

	Performance	Value	Features	Job Areas
Expert 1	0.43	0.27	0.18	0.11
Expert 2	0.35	0.28	0.23	0.15
Expert 3	0.28	0.24	0.26	0.22
Expert 4	0.36	0.11	0.23	0.3
Expert 5	0.37	0.14	0.31	0.18
Expert 6	0.22	0.24	0.33	0.2
Expert 7	0.57	0.03	0.29	0.11

Table: Individual perspective

APPENDIX C- RESULTS FROM ONLINE HDM TOOL

With the inconsistency under 0.1 and the disagreement of 0.084, this model was successfully evaluated and the results were predicted along with the calculations and weighing every criteria with the knowledge of experts.

BEST DEVICE TO REPLACE LAPTOPS AT INTEL	LENOVO Thinkpad t470 business laptop	ASUS Zenpad Z10	GOOGLE Pixelbook	MICROSOFT Surface Pro	Inconsistency
Experts	0.26	0.21	0.26	0.28	0
	0.15	0.18	0.38	0.29	0.02
	0.49	0.26	0.16	0.09	0.07
	0.32	0.3	0.2	0.18	0.07
	0.22	0.16	0.27	0.35	0.01
	0.11	0.3	0.36	0.22	0.07
	0.15	0.41	0.25	0.19	0.09
Mean	**0.24**	**0.26**	**0.27**	**0.23**	
Minimum	**0.11**	**0.16**	**0.16**	**0.09**	
Maximum	**0.49**	**0.41**	**0.38**	**0.35**	
Std. Deviation	**0.12**	**0.08**	**0.07**	**0.08**	
Disagreement					**0.084**

The statistical F-test for evaluating the null hypothesis (Ho: ric = 0) is obtained by dividing between-subjects variability with residual variability:

Source of Variation	Sum of Square	Deg. of freedom	Mean Square	F-test value
Between Subjects:	0.01	3	.002	**.18**
Between Conditions:	0.00	6	0.000	
Residual:	0.23	18	0.013	
Total:	**0.24**	**27**		
Critical F-value with degrees of freedom 3 & 18 at 0.01 level:				**5.09**
Critical F-value with degrees of freedom 3 & 18 at 0.025 level:				**3.95**
Critical F-value with degrees of freedom 3 & 18 at 0.05 level:				**3.16**
Critical F-value with degrees of freedom 3 & 18 at 0.1 level:				**2.42**

EXPERT 1

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.43
Value	0.27
Features	0.18
Job Areas	0.11
Inconsistency	0.00

Level-2	Performance	Value	Features	Job Areas
Spped	0.48	0.00	0.00	0.00
Upgrades	0.21	0.00	0.00	0.00
Battery	0.31	0.00	0.00	0.00
Durability	0.00	0.19	0.00	0.00
Price	0.00	0.39	0.00	0.00
Satisfaction	0.00	0.04	0.00	0.00
Maintenance	0.00	0.16	0.00	0.00
Discounts	0.00	0.14	0.00	0.00
Warranty	0.00	0.08	0.00	0.00
Handy/Mobility	0.00	0.00	0.21	0.00
USB port	0.00	0.00	0.48	0.00
Accessories	0.00	0.00	0.31	0.00
Software & IT	0.00	0.00	0.00	0.21
Sales & marketing	0.00	0.00	0.00	0.48
Business administration	0.00	0.00	0.00	0.31
Inconsistency	0.00	0.05	0.00	0.00

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.18	0.18	0.27	0.43	0.18	0.18	0.43	0.43	0.27	0.11	0.45	0.27	0.43	0.11	0.18
ASUS Zenpad Z10	0.11	0.11	0.43	0.27	0.43	0.11	0.11	0.18	0.11	0.43	0.05	0.11	0.11	0.18	0.11
GOOGLE Pixelbook	0.27	0.27	0.18	0.11	0.11	0.43	0.18	0.27	0.18	0.18	0.45	0.43	0.18	0.27	0.43
MICROSOFT Surface Pro	0.43	0.43	0.11	0.18	0.27	0.27	0.27	0.11	0.43	0.27	0.05	0.18	0.27	0.43	0.27
Inconsistency	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.26
ASUS Zenpad Z10	0.21
GOOGLE Pixelbook	0.26
MICROSOFT Surface Pro	0.28
Inconsistency	0.00

EXPERT 2

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.35
Value	0.28
Features	0.23
Job Areas	0.15
Inconsistency	0.01

Level-2	Performance	Value	Features	Job Areas
Spped	0.36	0.00	0.00	0.00
Upgrades	0.35	0.00	0.00	0.00
Battery	0.29	0.00	0.00	0.00
Durability	0.00	0.12	0.00	0.00
Price	0.00	0.13	0.00	0.00
Satisfaction	0.00	0.12	0.00	0.00
Maintenance	0.00	0.16	0.00	0.00
Discounts	0.00	0.21	0.00	0.00
Warranty	0.00	0.26	0.00	0.00
Handy/Mobility	0.00	0.00	0.26	0.00
USB port	0.00	0.00	0.39	0.00
Accessories	0.00	0.00	0.35	0.00
Software & IT	0.00	0.00	0.00	0.61
Sales & marketing	0.00	0.00	0.00	0.15
Business administration	0.00	0.00	0.00	0.24
Inconsistency	0.00	0.08	0.00	0.00

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.18	0.09	0.15	0.10	0.17	0.15	0.18	0.14	0.16	0.19	0.19	0.11	0.13	0.13	0.10
ASUS Zenpad Z10	0.12	0.17	0.16	0.25	0.20	0.19	0.13	0.28	0.19	0.20	0.28	0.18	0.13	0.16	0.17
GOOGLE Pixelbook	0.42	0.47	0.40	0.35	0.37	0.41	0.28	0.19	0.39	0.36	0.28	0.39	0.41	0.40	0.44
MICROSOFT Surface Pro	0.28	0.27	0.30	0.30	0.26	0.26	0.40	0.39	0.25	0.24	0.25	0.32	0.34	0.30	0.29
Inconsistency	0.04	0.01	0.00	0.07	0.02	0.03	0.03	0.04	0.01	0.01	0.00	0.07	0.02	0.01	0.00

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.15
ASUS Zenpad Z10	0.18
GOOGLE Pixelbook	0.38
MICROSOFT Surface Pro	0.29
Inconsistency	0.02

EXPERT 3

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.28
Value	0.24
Features	0.26
Job Areas	0.22
Inconsistency	0.05

Level-2	Performance	Value	Features	Job Areas
Spped	0.32	0.00	0.00	0.00
Upgrades	0.35	0.00	0.00	0.00
Battery	0.34	0.00	0.00	0.00
Durability	0.00	0.16	0.00	0.00
Price	0.00	0.15	0.00	0.00
Satisfaction	0.00	0.18	0.00	0.00
Maintenance	0.00	0.19	0.00	0.00
Discounts	0.00	0.12	0.00	0.00
Warranty	0.00	0.21	0.00	0.00
Handy/Mobility	0.00	0.00	0.51	0.00
USB port	0.00	0.00	0.33	0.00
Accessories	0.00	0.00	0.16	0.00
Software & IT	0.00	0.00	0.00	0.51
Sales & marketing	0.00	0.00	0.00	0.31
Business administration	0.00	0.00	0.00	0.17
Inconsistency	0.02	0.02	0.01	0.03

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.46	0.57	0.57	0.59	0.64	0.45	0.52	0.44	0.46	0.50	0.42	0.43	0.46	0.49	0.37
ASUS Zenpad Z10	0.26	0.08	0.23	0.22	0.20	0.30	0.29	0.21	0.26	0.30	0.32	0.31	0.31	0.26	0.31
GOOGLE Pixelbook	0.20	0.22	0.15	0.14	0.11	0.16	0.11	0.21	0.18	0.11	0.16	0.17	0.13	0.16	0.22
MICROSOFT Surface Pro	0.08	0.13	0.05	0.05	0.05	0.09	0.08	0.14	0.09	0.09	0.10	0.09	0.11	0.10	0.10
Inconsistency	0.02	0.10	0.08	0.10	0.04	0.05	0.07	0.06	0.11	0.15	0.08	0.04	0.09	0.07	0.14

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.49
ASUS Zenpad Z10	0.26
GOOGLE Pixelbook	0.16
MICROSOFT Surface Pro	0.09
Inconsistency	0.07

EXPERT 4

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.36
Value	0.11
Features	0.23
Job Areas	0.30
Inconsistency	0.30

Level-2	Performance	Value	Features	Job Areas
Spped	0.27	0.00	0.00	0.00
Upgrades	0.13	0.00	0.00	0.00
Battery	0.60	0.00	0.00	0.00
Durability	0.00	0.13	0.00	0.00
Price	0.00	0.10	0.00	0.00
Satisfaction	0.00	0.33	0.00	0.00
Maintenance	0.00	0.10	0.00	0.00
Discounts	0.00	0.17	0.00	0.00
Warranty	0.00	0.17	0.00	0.00
Handy/Mobility	0.00	0.00	0.18	0.00
USB port	0.00	0.00	0.38	0.00
Accessories	0.00	0.00	0.44	0.00
Software & IT	0.00	0.00	0.00	0.51
Sales & marketing	0.00	0.00	0.00	0.19
Business administration	0.00	0.00	0.00	0.30
Inconsistency	0.31	0.03	0.08	0.01

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.27	0.24	0.27	0.55	0.34	0.49	0.44	0.30	0.57	0.33	0.32	0.42	0.28	0.30	0.39
ASUS Zenpad Z10	0.40	0.46	0.32	0.22	0.29	0.21	0.28	0.24	0.20	0.23	0.26	0.19	0.37	0.15	0.27
GOOGLE Pixelbook	0.23	0.12	0.21	0.06	0.17	0.17	0.15	0.24	0.16	0.25	0.26	0.23	0.18	0.18	0.20
MICROSOFT Surface Pro	0.10	0.18	0.20	0.16	0.20	0.13	0.13	0.22	0.06	0.20	0.16	0.16	0.17	0.37	0.15
Inconsistency	0.08	0.02	0.18	0.04	0.01	0.03	0.01	0.00	0.06	0.01	0.04	0.01	0.02	0.04	0.04

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.32
ASUS Zenpad Z10	0.30
GOOGLE Pixelbook	0.20
MICROSOFT Surface Pro	0.18
Inconsistency	0.07

EXPERT 5

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.37
Value	0.14
Features	0.31
Job Areas	0.18
Inconsistency	0.02

Level-2	Performance	Value	Features	Job Areas
Spped	0.44	0.00	0.00	0.00
Upgrades	0.34	0.00	0.00	0.00
Battery	0.21	0.00	0.00	0.00
Durability	0.00	0.28	0.00	0.00
Price	0.00	0.10	0.00	0.00
Satisfaction	0.00	0.11	0.00	0.00
Maintenance	0.00	0.21	0.00	0.00
Discounts	0.00	0.13	0.00	0.00
Warranty	0.00	0.17	0.00	0.00
Handy/Mobility	0.00	0.00	0.52	0.00
USB port	0.00	0.00	0.17	0.00
Accessories	0.00	0.00	0.31	0.00
Software & IT	0.00	0.00	0.00	0.29
Sales & marketing	0.00	0.00	0.00	0.50
Business administration	0.00	0.00	0.00	0.21
Inconsistency	0.00	0.04	0.06	0.00

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.22	0.21	0.21	0.15	0.16	0.16	0.21	0.25	0.19	0.20	0.30	0.20	0.35	0.17	0.33
ASUS Zenpad Z10	0.16	0.14	0.15	0.10	0.12	0.15	0.14	0.25	0.17	0.16	0.17	0.16	0.24	0.17	0.18
GOOGLE Pixelbook	0.25	0.29	0.21	0.25	0.35	0.34	0.31	0.25	0.31	0.31	0.27	0.31	0.17	0.29	0.23
MICROSOFT Surface Pro	0.36	0.36	0.42	0.51	0.37	0.36	0.34	0.25	0.33	0.33	0.25	0.33	0.24	0.37	0.27
Inconsistency	0.03	0.01	0.01	0.03	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.00	0.02	0.01

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.22
ASUS Zenpad Z10	0.16
GOOGLE Pixelbook	0.27
MICROSOFT Surface Pro	0.35
Inconsistency	0.01

EXPERT 6

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.22
Value	0.24
Features	0.33
Job Areas	0.20
Inconsistency	0.26

Level-2	Performance	Value	Features	Job Areas
Spped	0.31	0.00	0.00	0.00
Upgrades	0.16	0.00	0.00	0.00
Battery	0.53	0.00	0.00	0.00
Durability	0.00	0.30	0.00	0.00
Price	0.00	0.15	0.00	0.00
Satisfaction	0.00	0.12	0.00	0.00
Maintenance	0.00	0.10	0.00	0.00
Discounts	0.00	0.19	0.00	0.00
Warranty	0.00	0.13	0.00	0.00
Handy/Mobility	0.00	0.00	0.23	0.00
USB port	0.00	0.00	0.08	0.00
Accessories	0.00	0.00	0.69	0.00
Software & IT	0.00	0.00	0.00	0.47
Sales & marketing	0.00	0.00	0.00	0.45
Business administration	0.00	0.00	0.00	0.08
Inconsistency	0.00	0.11	0.01	0.07

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.08	0.08	0.07	0.08	0.11	0.12	0.10	0.13	0.15	0.09	0.14	0.14	0.22	0.05	0.07
ASUS Zenpad Z10	0.25	0.47	0.28	0.30	0.36	0.36	0.44	0.40	0.36	0.19	0.35	0.35	0.27	0.16	0.14
GOOGLE Pixelbook	0.52	0.25	0.42	0.44	0.35	0.30	0.27	0.19	0.20	0.53	0.23	0.33	0.26	0.46	0.29
MICROSOFT Surface Pro	0.15	0.20	0.23	0.18	0.18	0.22	0.19	0.27	0.29	0.19	0.28	0.18	0.25	0.33	0.51
Inconsistency	0.10	0.13	0.06	0.02	0.06	0.01	0.07	0.02	0.02	0.04	0.03	0.05	0.16	0.09	0.08

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.11
ASUS Zenpad Z10	0.30
GOOGLE Pixelbook	0.36
MICROSOFT Surface Pro	0.22
Inconsistency	0.07

EXPERT 7

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
Performance	0.57
Value	0.03
Features	0.29
Job Areas	0.11
Inconsistency	0.28

Level-2	Performance	Value	Features	Job Areas
Spped	0.44	0.00	0.00	0.00
Upgrades	0.04	0.00	0.00	0.00
Battery	0.52	0.00	0.00	0.00
Durability	0.00	0.30	0.00	0.00
Price	0.00	0.13	0.00	0.00
Satisfaction	0.00	0.18	0.00	0.00
Maintenance	0.00	0.09	0.00	0.00
Discounts	0.00	0.10	0.00	0.00
Warranty	0.00	0.20	0.00	0.00
Handy/Mobility	0.00	0.00	0.49	0.00
USB port	0.00	0.00	0.17	0.00
Accessories	0.00	0.00	0.34	0.00
Software & IT	0.00	0.00	0.00	0.57
Sales & marketing	0.00	0.00	0.00	0.07
Business administration	0.00	0.00	0.00	0.35
Inconsistency	0.29	0.09	0.01	0.09

Level-3	Spped	Upgrades	Battery	Durability	Price	Satisfaction	Maintenance	Discounts	Warranty	Handy/Mobility	USB port	Accessories	Software & IT	Sales & marketing	Business administration
LENOVO Thinkpad t470 business laptop	0.11	0.17	0.18	0.14	0.14	0.19	0.16	0.12	0.15	0.15	0.18	0.18	0.16	0.19	0.14
ASUS Zenpad Z10	0.45	0.34	0.38	0.38	0.27	0.36	0.20	0.48	0.41	0.40	0.26	0.47	0.43	0.29	0.45
GOOGLE Pixelbook	0.22	0.32	0.26	0.29	0.30	0.24	0.31	0.24	0.28	0.26	0.35	0.21	0.19	0.34	0.24
MICROSOFT Surface Pro	0.22	0.16	0.18	0.19	0.29	0.21	0.33	0.15	0.17	0.19	0.20	0.14	0.22	0.18	0.17
Inconsistency	0.07	0.03	0.02	0.01	0.09	0.01	0.02	0.05	0.06	0.05	0.05	0.12	0.03	0.27	0.04

The final result:

Level-1	BEST DEVICE TO REPLACE LAPTOPS AT INTEL
LENOVO Thinkpad t470 business laptop	0.15
ASUS Zenpad Z10	0.41
GOOGLE Pixelbook	0.25
MICROSOFT Surface Pro	0.19
Inconsistency	0.09