

**TAMPEREEN TEKNILLINEN YLIOPISTO**  
**TEOLLISUUSTALOUDEN LAITOS**

**TETA-5510 Teknologiastrategia ja -johtaminen**  
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**Kirjoita nimesi, osastosi, sähköpostiosoitteesi sekä opiskelijanumerosi vastauspaperiin.**

Vastaa selvällä käsialalla.

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**TENTTI 9.12.2009**

1. Liitteessä 1 on kuvaus SSD-massamuisteista ja muutamia hintatietoja. Sovella Utterback & Abernathyn (1975) viitekehystä tuote- ja prosessi-innovaatioista. Miten massamuistitoimiala on kehittynyt? Millä mittauksilla tapahtunutta ja tulevaa kehitystä? Mikä on arviosi mukaan SSD-levyn nykyinen vaihe? Perustele. [8 p]

2. Selitä, miten kilpailun perusteet kehittyvät Christensenin (1997) mallin mukaan. Kuvaa SSD-massamuistitoimialan kehitystä tällä mallilla. [8 p]

3. Oletetaan, että olet vastapalkattu analyytikko Sonylla, ja teknologiajohtajanne antaa sinulle tehtäväksi laatia ominaisuusanalyysi eräästä tuotteestanne, 40" LCD televisiosta. Liitteessä 2 on esitetty tämän tuotteen ominaisuusluettelo.

Tee Laniganin (1994) oppien mukaan tuotteessa käytettävien eri teknologioiden analyysi: Mitkä teknologiat ovat, missä elinkaaren vaiheessa teknologiat ovat (arvioi), entä mikä on niiden merkitys kilpailukyvyn perustana nyt ja tulevaisuudessa? Tee taulukko ja perustele näkemyksesi. [8 p]

## LIITE 1

<http://fi.wikipedia.org/wiki/SSD> (katkelma)

”SSD-massamuisti (Solid-state Drive) on massamuisti, joka ei sisällä liikkuvia osia. Tavallisimmin SSD sisältää Flash-muistin ja ohjainosan samassa kotelossa. SSD puolijohdelevyä käytetään myös kiintolevyn korvaajana. Tiedot säilyvät SSD:lla koska Flash-muisti on haihtumaton muistityyppi, jossa tieto säilyy jopa 10 vuotta ilman sähkönsyöttöä. Laitteen virrankulutus on kiintolevyä pienempi, haku aika nopeampi ja se on äänetön. Laitteen iskunkestävyys on myös paljon suurempi kuin kiintolevyllä, mikä on tärkeää esimerkiksi kannettavissa tietokoneissa. Laitteen liitännät tietokoneisiin tapahtuu samoilla liitännätavoilla kuin kiintolevynkin (Serial ATA ja PATA), tai USB-väylän kautta.

Vuonna 2007 kaupallisten SSD-muistien maksimikoko oli 32 GB ja hinta n. 1000 dollaria ja parhaiden mallien luku- ja myös kirjoitusnopeus ohitti nopeimmat kiintolevyt. Keväällä 2008 markkinoille tuli useita merkkejä ja malleja suurilta valmistajilta kuten Samsung ja laitteen säilytyskapasiteetti kasvoi 128 GB:ksi ja myös laitteiden hinta alkoi laskea rajusti. Suuret kannettavien tietokoneiden valmistajat, kuten DELL ja Apple, tarjoavat kesällä 2008 SSD:a optiona joihinkin uusiin kannettaviin tietokoneisiin.

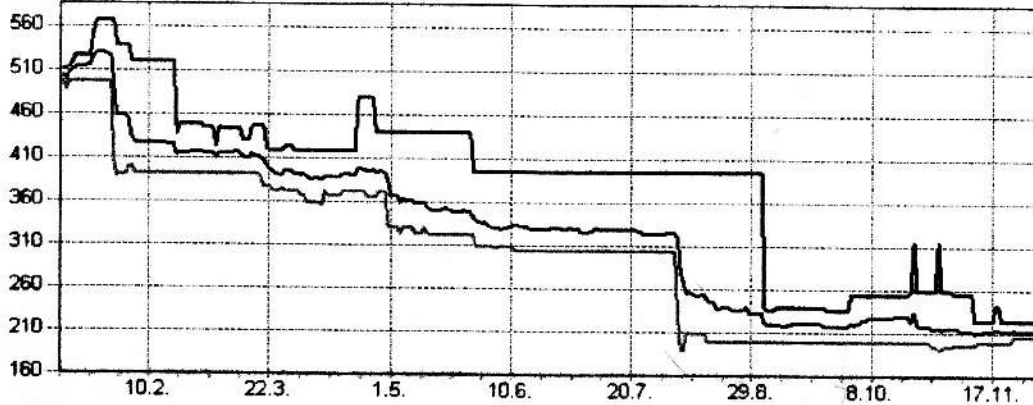
Uusien SSD:en tekniikka perustuu NAND-Flash:iin, joka mahdollistaa suuremman kirjoitusnopeuden kuin aiemmissa muistitikuissa ja muistikorteissa. Flash-tekniikan toinen ongelma on rajallinen elinikä: samaan muistisoluun voidaan uudelleen kirjoittaa tieto vain teknologian rajoittama määrä kertoja ennen kuin solu "kuluu" loppuun. SSD:n sisäinen ohjain estää yksittäisen solun kulumista kirjoittamalla usein muuttuvan tiedon aina uuteen paikkaan ja pitämällä tarkistuskirjanpitoa (virhekorjauskoodia eli ECC-bittejä) "itsestään" muuttuneista tiedosta. Tuhoutunut solu merkitään rikkiäiseksi ja aseman käytössä oleva koko pienenee, kun soluja tuhoutuu.

MLC (Multi Level Cell) ja SLC (Single Level Cell) ovat NAND-Flash tekniikan osia, solutyyppinä. Nelitilainen MLC on edullisempi mutta vikaherkempi, binäärinen SLC on nopeampi ja kalliimpi. MLC soluja tarvitaan puolet vähemmän kuin kaksitilaisia, mutta noin puolet suurempi virhekorjausbittien tarve vie osan saadusta hyödystä.

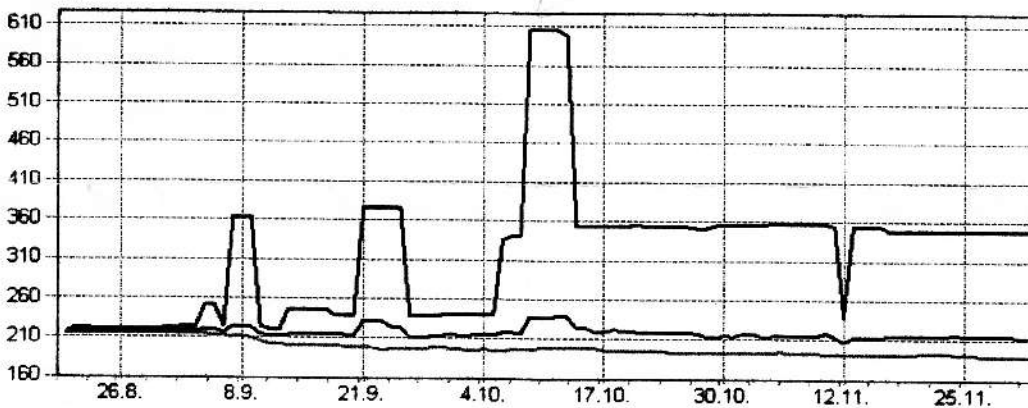
SSD-muistin virrankulutuksesta ja kestoikästä on esitetty vielä kriittisiä arvioita.”

Hintatietoja joistakin SSD-levyistä (hintaseuranta.fi, 4.12.2009) (punaisella ylin hinta, vihreällä alin hinta, keskihinta sinisellä)

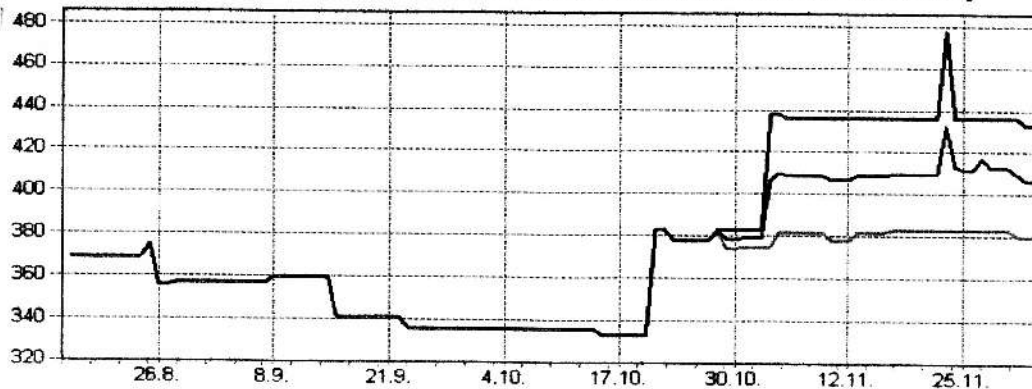
Kingston SSDNow M Series SNM125-S2/80GB (80 Gt, 2.5", sarja-ata II), SSD-kiintolevy



Kingston SSDNow V Series (128 Gt, 2.5", sarja-ata II) SNV125-S2/128GB, SSD-kiintolevy



Patriot Torqx (128 Gt, 2.5", sarja-ata II) PFZ128GS25SSDR, SSD-kiintolevy



LITE 2.

## Sony KDL-40XBR4 40" LCD Display

Over the years XBR has stood for the best consumer TV's Sony has to offer and this year's line up is no exception. The XBR line of Full HD 1080p televisions incorporate all of Sony's latest technologies (including HDMI v1.3 features such as x.v.Color and Deep Color). Additional features like Motionflow™ 120Hz enable smoother motion when viewing movies or fast-action sports. BRAVIA Engine PRO with Digital Reality Creation upconverts all interlaced and progressive video signals including HD signals directly to 1080p for amazing detail and sharpness. And it's only fitting that your XBR make a statement not only through breathtaking picture quality, but by taking your breath away with optional color bezels. Now your LCD TV can be as distinct as your own personal style.



### Full HD 1080

There are a lot of ways to define high-definition but BRAVIA® Full HD means you're getting the best resolution that high-definition has to offer consumers. With Sony BRAVIA XBR HDTVs, Full HD 1080 means 1920 x 1080 pixels and 1080p video inputs. Your lifestyle demands the best in high-definition and with BRAVIA Full HD 1080 products you get it.

### 1920 x 1080 Native Panel Resolution

When it comes to high-definition TV the pinnacle of performance is achieved by using 1920 x 1080 display panels. Full HD 1920 x 1080 panel resolution with over 2 million pixels 5(more than twice that of 720p HDTV) is exactly what you need to reproduce the 1080p content that can be delivered by our cutting edge 1080p Blu-ray disc™ player.

### 10-bit Processing and 10-bit Display

While it's great to state that a TV is capable of creating billions of colors it's a whole lot better when you have a display that can actually display them. That's the logic behind Sony's 10-bit processor and 10-bit display. Sony follows 10-bit processing with a 10-bit panel, allowing 64 times the levels of color expression than an 8-bit panel. What that translates to is smoother transitions from color to color and subtle color changes faithfully reproduced.

HDMI v1.3 spec and which Sony participated in creating), the color space has been greatly expanded. 1.8 times as many natural colors as existing HDTV signals will now be faithfully reproduced. x.v.Color enabled products can now offer more accurate color reproduction and natural colors beyond broadcast HDTV.

### **24p True Cinema (24p Input Capability)**

Many movies are filmed at 24 frames per second (fps) and prime time TV programs are recorded at 24p. Seizing on an opportunity, some studios are taking a purist approach and encoding high definition video content such as Blu-ray Disc™ in 24p. Sony wisely takes advantage of this by including 24p output capability on our Blu-ray Disc™ players as well as including 24p input capability select 2007 BRAVIA TVs. The benefit? Images are smooth and natural looking. Once you experience 24p video it will be hard to view video without it.

### **DMex - Ready (Digital Media Extender)**

Sony's Digital Media Extender (DMex) ready televisions offer a digital connection path for the addition of the optional modules like the new BRAVIA Internet Video Link. With innovative DMex expansion capabilities featuring the Emmy® award winning XMB user interface, these models are not merely TVs, but powerful entertainment platforms that not only meet your needs today, but extend to add new features seamlessly.

### **Xross Media Bar® (XMB) interface**

When was the last time you saw an on-screen display that was fast, fun and easy to use? Sony's award-winning Xross Media Bar™ (pronounced Cross) provides a logical and fast way to access set up menus, user controls, and more. The on-screen display comes to life by pushing the XMB menu button on the remote. Navigation through the menus is smooth and fast.

### **BRAVIA® Theatre Sync™ technology**

Sony® created BRAVIA® Theatre Sync™ to go beyond basic digital audio and video transmission. Based on the HDMI-CEC function, BRAVIA® Theatre Sync™ will be included on select BRAVIA® Theatre home A/V systems and components. This useful function reduces the hassle and time consuming job of powering up, routing signals, etc. to the simple push of one button. Want to play your DVD on your Sony® A/V system? Easy, just push PLAY on the BRAVIA® HDTV remote and everything is taken care of for you. Even when the system is off! Want to change from TV sound to digital surround sound through your Sony BRAVIA® Theatre A/V system? Just one push of the Theater Sound button on the remote and voila, surround sound through your system. Want to power down everything once you've finished enjoying it? Push one button and the TV and A/V system powers down. BRAVIA® Theatre Sync™ helps make things a whole lot easier to operate.

### **Motionflow™ 120 Hz with Full HD high frame rate capability**

Taking motion performance to the next level requires innovation and expertise. Enter Sony's Motionflow™ High Frame Rate technology. Motionflow™ detects the incoming video signal and applies the appropriate processing for optimum motion reproduction. Taking full advantage of film sourced 24fps encoded content available on DVD and Blu-ray Disc, Motionflow™ eliminates the need for 3:2 pulldown and delivers smooth, judder free video, faithfully preserving the integrity of the original film. When 60fps content is detected, Motionflow™ doubles the amount of frames and uses real-time calculation to create a new level of natural motion reproduction. You'll experience movies and sports with a greater sense of realism than ever before.

### **BRAVIA Engine™ PRO Full Digital Video Processor**

BRAVIA Engine™ PRO builds upon the BRAVIA Engine system's outstanding video processing functions making it Sony's most advanced video processing system. It is the culmination of our legendary picture quality expertise, featuring the latest generation of proprietary video processing technology: Digital Reality Creation - Multi Function (DRC-MFv2.5). This technology creates a high-density video signal that traditional interpolation video processing cannot achieve. This latest generation of DRC-MF features increased processing power and provides a sharp, crystal clear image with both 480i and 480p standard definition and all high definition sources (except 1080p). It also features "1080p Direct Creation" which minimizes loss in interlace-to-progressive (IP) conversion by performing Digital Reality Creation and IP Creation algorithms simultaneously.

### **Live Color Creation™ System featuring WCG-CCFL**

Many colors in the real world such as deep reds, greens and clear blues cannot be expressed with conventional display technologies. Working in combination with the special WCG-CCFL backlight in LCD HDTVs or the optical engine in our MDPJ HDTVs, Live Color Creation technology achieves wide color reproduction using advanced chroma signal processing algorithms. The primary benefits are clear blues, natural greens and an overall vibrant color for all scenes.

### **Advanced Contrast Enhancer (ACE) Function**

Sony's Advanced Contrast Enhancer (ACE) builds on our excellent on-contrast ratio performance of 2000:1. A Dynamic Contrast Ratio of up to 18,000:1 is achieved by using real-time image processing to adjust the contrast along with optimizing backlight levels. But rather than focus on the "numbers", Sony focuses on actual picture performance avoiding exaggerated blacks where detail can be lost. ACE translates to blacker blacks in darker scenes, as well as better shadow detail in other scenes for a difference that you can see.

### **x.v.Color™ technology**

BRAVIA® HDTV's performance has now advanced to the point that the color range can be defined by limitations in the original video source, rather than the TV. Thanks to the adoption of a newly approved international color standard called xvYCC (an option in the