



Tangerang, 24-09-2024

Nomor : 009/HIMATIN/IX/2024
Lampiran : -
Perihal : Permohonan Menjadi Pembicara

Kepada Yth.
Bapak Dr.Lamto Widodo, S.T.,M.T.
Di tempat

Dengan hormat,

Sehubungan dengan dilaksanakannya kegiatan workshop dengan tema “Pemanfaatan IoT untuk Mendukung Implementasi Ergonomi di Tempat Kerja” maka kami dari Himpunan Mahasiswa Teknik Industri (HIMATIN) UBD memohon kesediaan Bapak sebagai pembicara dalam kegiatan tersebut yang akan dilaksanakan pada:

Hari/Tanggal : Sabtu/12 Oktober 2024
Jam : 14.00 – 17.00 WIB
Tempat : Aula Dipankara, UBD

Demikian surat permohonan ini kami sampaikan, kami ucapan terimakasih.

Hormat kami,



Sita Dwi Anisa
Ketua HIMATIN

Felicia Apriany
Ketua Pelaksana

Mengetahui,

Dr. Abidin, S.T.,M.Si.
Kaprodi Teknik Industri UBD



MAFST
MAKROFOKUS ASSOCIATION FOR SCIENCE & TECHNOLOGY
UNIVERSITY OF TARUMANAGARA JAKARTA



WORKSHOP

“Pemanfaatan IoT untuk Mendukung Implementasi Ergonomi di Tempat Kerja”

DAFTAR SEKARANG

<https://forms.gle/oka7EKJDEMDAe4CR8>

BIAYA PENDAFTARAN

Rp. 35.002 / SLOT



BENEFITS

- Knowledge of IoT and Ergonomics
- Sertifikat SKPI
- Snack

Dr. Lamto Widodo, S. T., M. T.

Dosen Teknik Industri Universitas Tarumanagara Jakarta

HARI SABTU,

12 OKTOBER 2024



Metode Pembayaran:
Bank Rakyat Indonesia (BRI)
113201001000302
a.n Perkumpulan Boen Tek Bio



MULAI JAM

14.00 - 16.50 WIB

SPONSORED BY:



MEDIA PARTNER BY:





SERTIFIKAT

Penghargaan

Diberikan Kepada:

Dr. LAMTO WIDODO, S.T ., M. T.

Atas Partisipasinya sebagai
Pembicara

Dalam Acara Workshop Himpunan Mahasiswa Teknik Industri Universitas
Buddhi Dharma yang bertemakan "Pemanfaatan IoT Untuk Implementasi
Ergonomi di Tempat Kerja"



Siti Dwi Anisa
Ketua HIMATIN

Tangerang, 12 Oktober 2024

Felicia Apriany
Ketua Pelaksana



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INDUSTRIAL
ENGINEERING



UNTAR untuk INDONESIA & DUNIA

"Pemanfaatan IoT untuk mendukung Implementasi Ergonomi di tempat kerja"

Dr. Lamto Widodo, ST. MT. IPM

Industrial Engineering, Universitas Tarumanagara Jakarta
Indonesian Ergonomic Association (PEI)



Disampaikan pada Workshop Ergonomi Universitas Buddhi Tangerang, Banten, 12 Oktober 2024

FASILITATOR

LAMTO WIDODO
ST.MT.Dr.IPM.

Email:

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Perhimpunan Ergonomi Indonesia (PEI)
Universitas Tarumanagara Jakarta

Call/WA: 085890499995

Riwayat Pendidikan

- 1993: Teknik Mesin ITS (S1) - Desain
- 1997: Teknik dan Manajemen Industri UI (S2)
 - Ergonomi Kerja
- 2012: Teknik Mesin dan Bio Sistem IPB (S3)
 - Ergonomi Makro



Fokus Penelitian

- ✓ K3
- ✓ Ergonomi
- ✓ Inovasi Produk
- ✓ Perancangan Sistem Kerja
- ✓ Ekonomi Teknik

Publikasi

Google Scholar H-index: 9
i10-index : 8

Scopus H-index: 4
WoS G-Index:1

Riwayat Pekerjaan

1994-sekarang

Dosen Teknik Industri FT Universitas Tarumanagara Jakarta

2022-sekarang

Manajer Pembelajaran FT Untar Jakarta

2019-2022

Manajer Pembelajaran dan Evaluasi Direktorat Pembelajaran Untar

2009 - 2018

Kaprodi Teknik Industri FT Universitas Tarumanagara Jakarta

1999-sekarang

Anggota Perhimpunan Ergonomi Indonesia

2007 - 2020

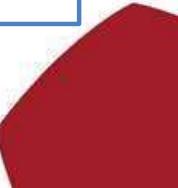
Ketua Korwil BKSTI - DKI Jakarta

2007-sekarang

Pengurus BKSTI Pusat



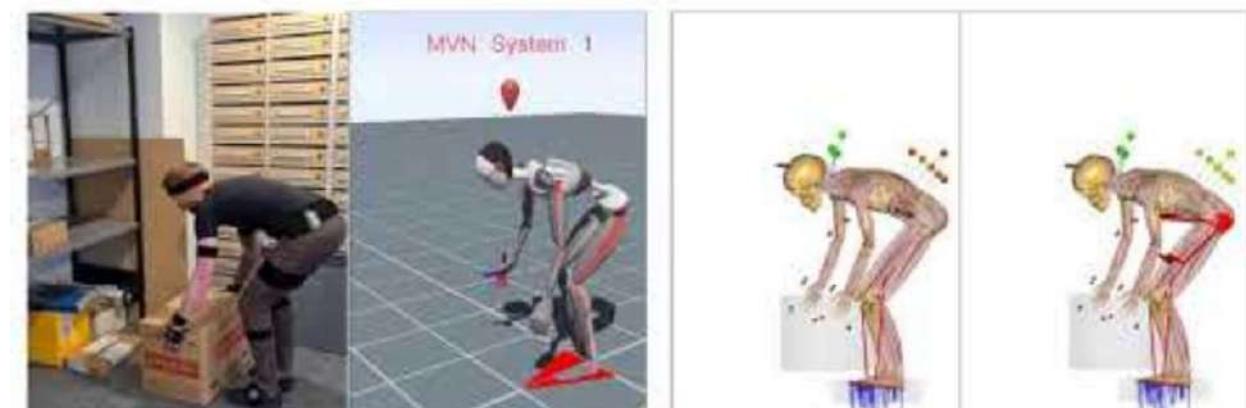
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Mari lihat sejenak

Workplace analysis with simulation driven ergonomic assessment

Extend your output from traditional ergonomic assessment standards along with biomechanical parameters as muscle activity and forces, joint reaction forces and metabolism



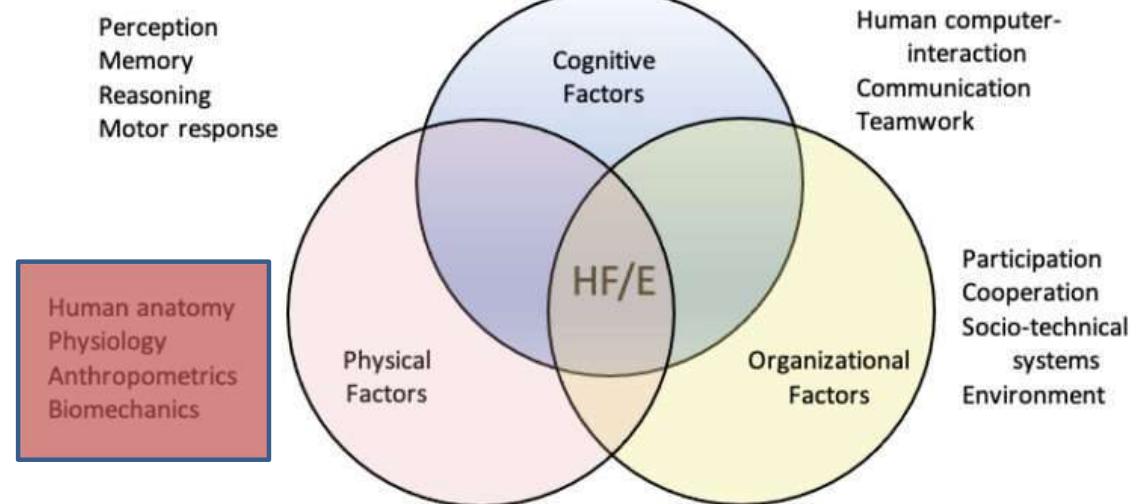
An NV logo and text: "Project co-financed by the European Union. This project has been funded with support from the European Commission. This publication reflects the views only of the author(s) and the Commission cannot be held responsible for any use which may be made of the information contained therein."

Project: "Ergonomics Assessment Methodologies in Manufacturing Environments (EAMEN)"

imko ANYBODY TECHNOLOGY



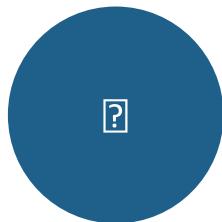
*is the scientific discipline concerned with the understanding of **interactions among humans and other elements of a system**, and the profession that applies theory, principles, data, and methods to design in order to **optimize human well-being and overall system performance**.*



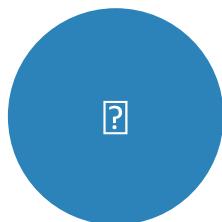
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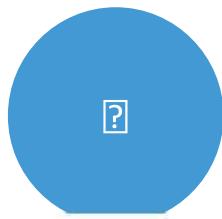
What is Ergonomics - Prof Iftikar Z Sutalaksana et.al.



Ergonomics is a branch of science that systematically utilizes information about human nature, abilities and limitations to design a work system so that people can live and work in the system properly, namely achieving the desired goals through the work effectively, safely and comfortably.

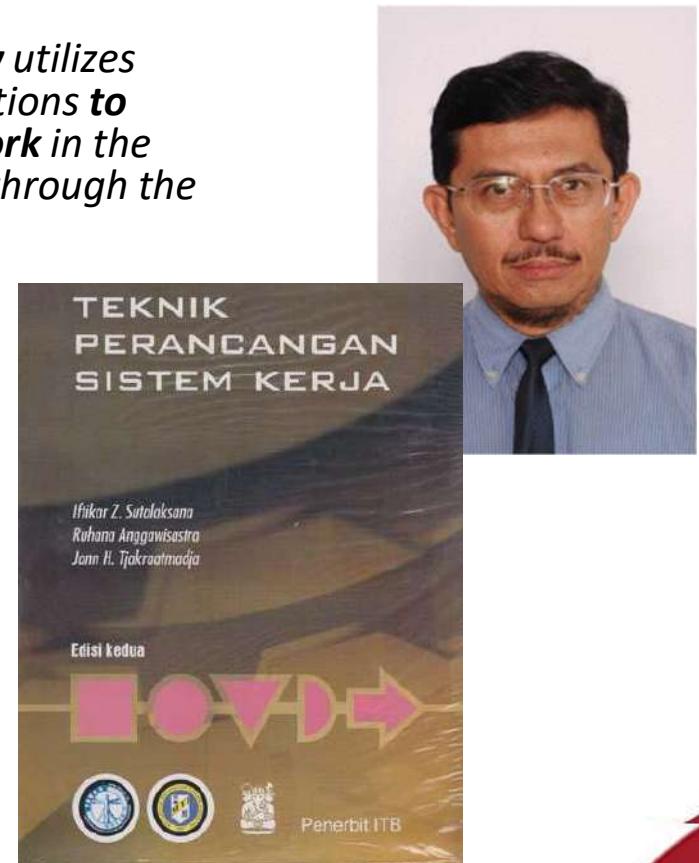


Ergonomics is supported by: Psychology, Anthropology, Work Physiology, Biology, Sociology, Work Planning, Physics, etc.

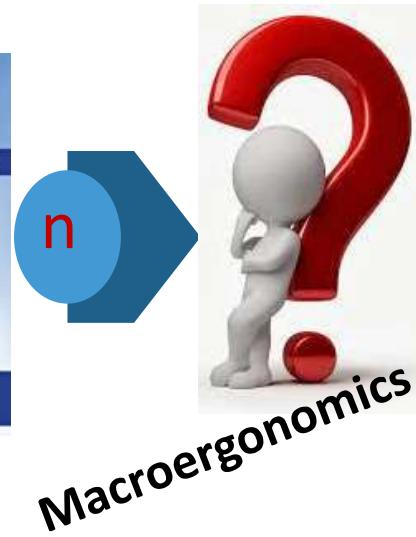
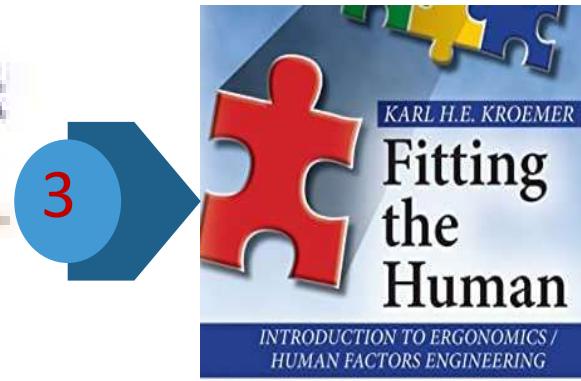
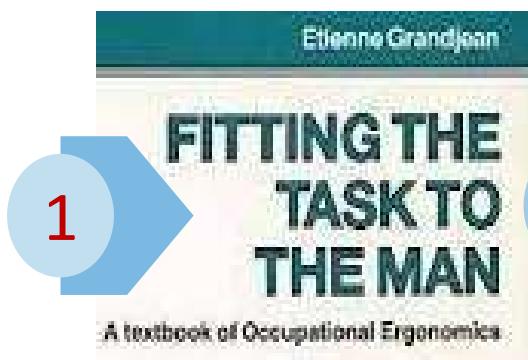


Ergonomics and similar terms

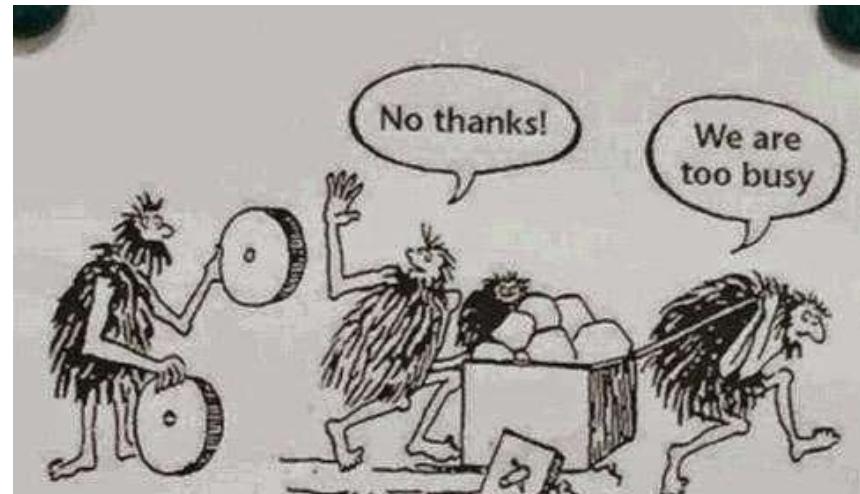
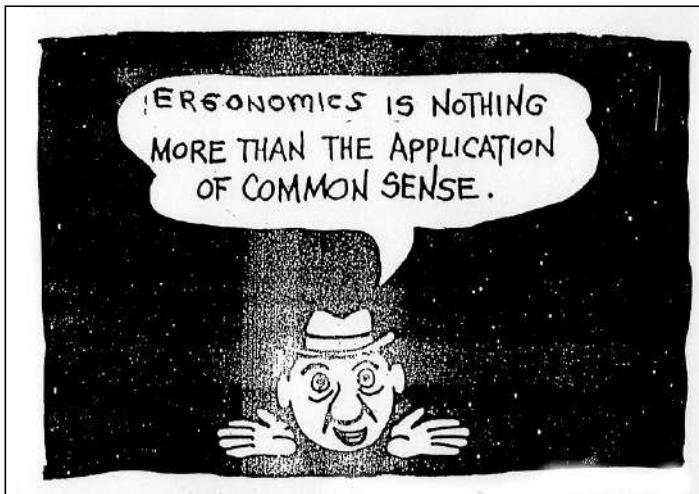
- *Ergonomics (UK)*
- *Arbeitswissenschaft ()*
- *Biotechnology (Skandinavia)*
- *Human Factor (US)*



FITTING paradigm in ergonomics, where else.....



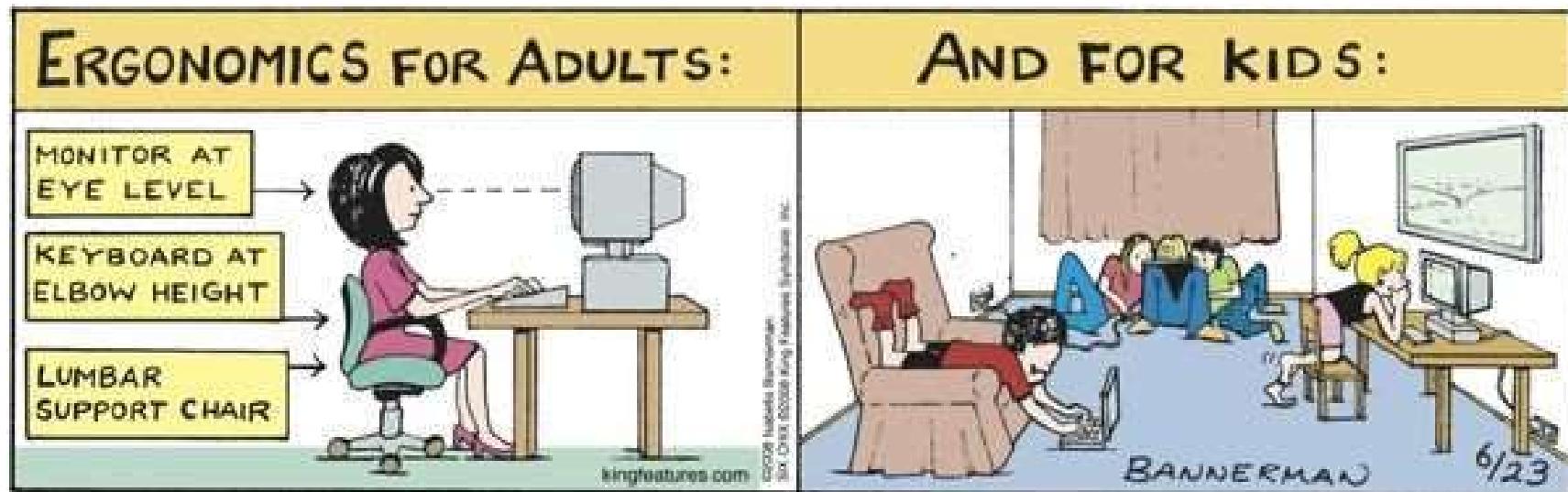
Ergonomic in cartoon [1]



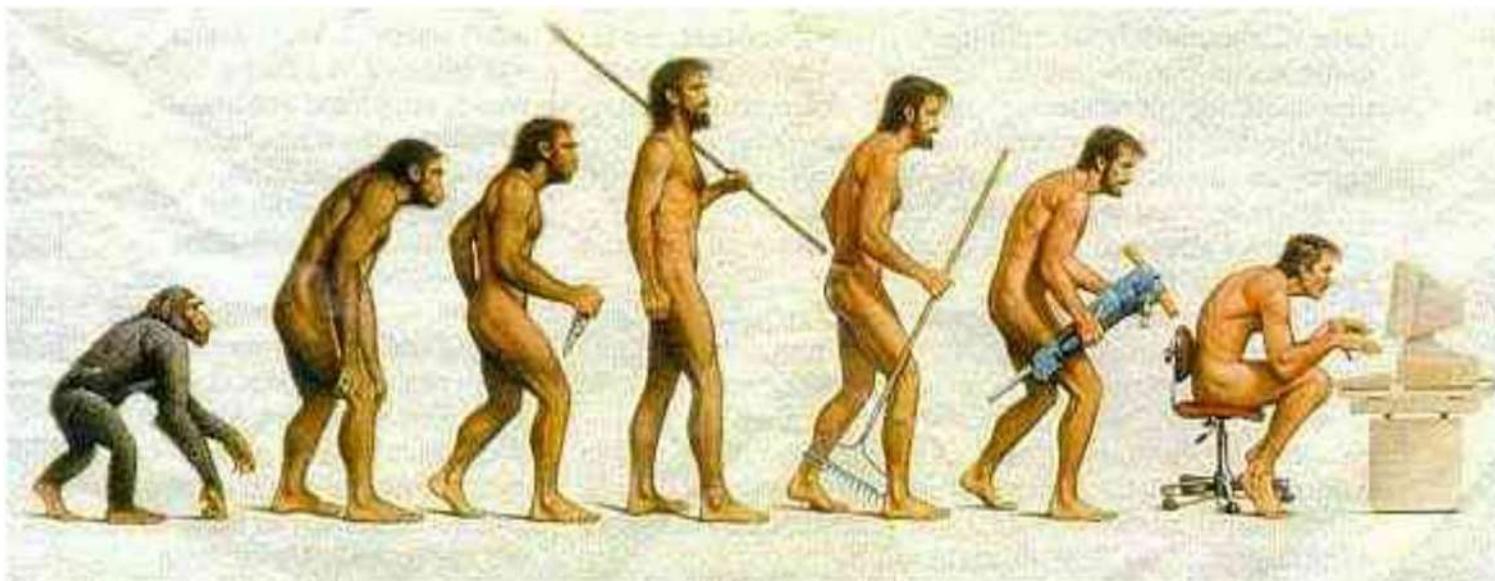
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Ergonomic in cartoon (2)



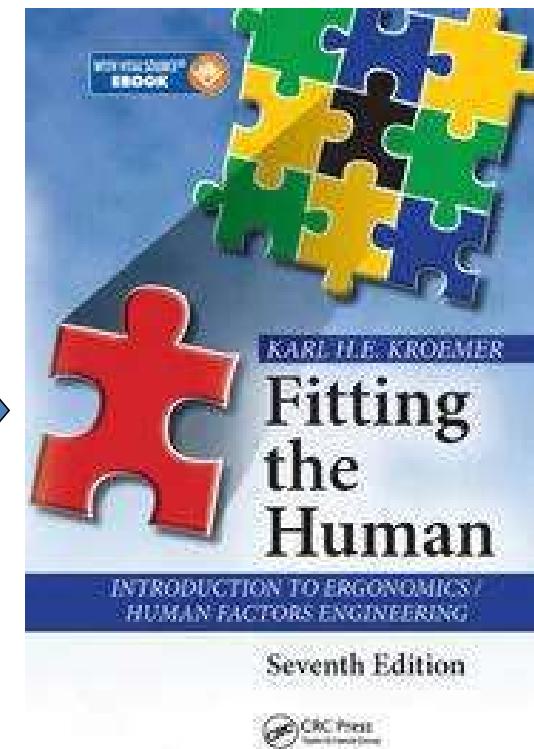
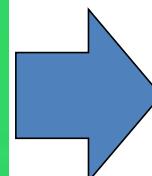
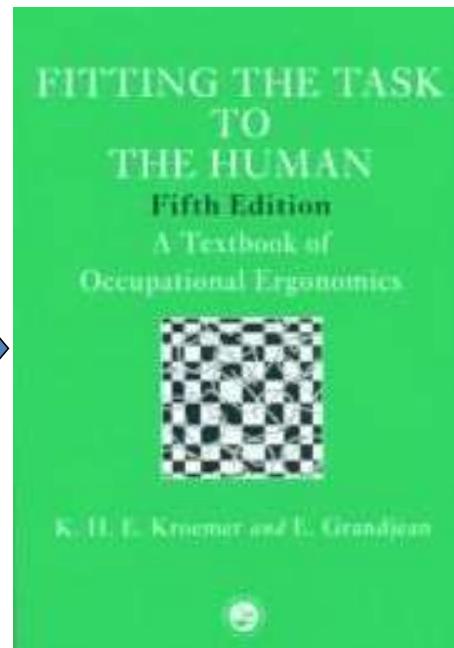
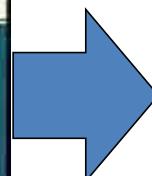
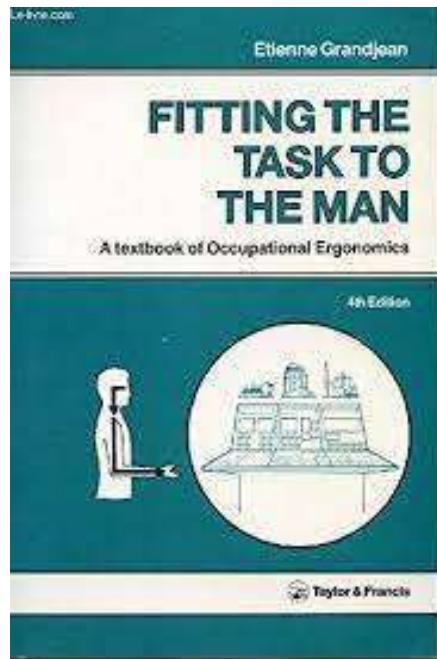
Ergonomi.....



SALAH DESAIN
BERARTI ANDA
MENGEMBALIKAN
RODA EVOLUSI ??

*“ ... a method for systematic study of the physiological
And psychological requirements for a product and
Its manufacturing process from a human point of view “*
(Knut Holt, Product Innovation Management, 1983)

Filosofi Ergonomi



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Ergonomi. ergonomi.

Ilmu dan Praktek

mengenai perancangan kerja dan tempat kerja yang disesuaikan dengan kapabilitas dan keterbatasan tubuh dan psikologis manusia.



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MENTERI KETENAGAKERJAAN
REPUBLIK INDONESIA

SALINAN

PERMENAKER No. 5 tahun 2018

PERATURAN MENTERI KETENAGAKERJAAN
REPUBLIK INDONESIA
NOMOR 5 TAHUN 2018
TENTANG
KESELAMATAN DAN KESEHATAN KERJA
LINGKUNGAN KERJA

14. Faktor Ergonomi adalah faktor yang dapat mempengaruhi aktivitas Tenaga Kerja, disebabkan oleh ketidaksesuaian antara fasilitas kerja yang meliputi cara kerja, posisi kerja, alat kerja, dan beban angkat terhadap Tenaga Kerja.

KEPUTUSAN KEPALA BADAN STANDARDISASI NASIONAL

NOMOR 590/KEP/BSN/12/2021

TENTANG

PENETAPAN SNI 9011:2021 PENGUKURAN DAN EVALUASI POTENSI
BAHAYA ERGONOMI DI TEMPAT KERJA

SNI 9011 - 2021

FAKTOR ERGONOMI

- CARA KERJA
- POSISI KERJA
- ALAT KERJA
- BEBAN ANGKAT

MENGAPA ERGONOMI PENTING?

1

menciptakan lingkungan *KERJA YANG AMAN* di dalam pabrik manufaktur.

2

menawarkan *CARA UNTUK MENGOPTIMALKAN INTERAKSI* antara lingkungan kerja dan pekerja di dalamnya

3

penting untuk mengidentifikasi *FAKTOR RISIKO ERGONOMI YANG POTENSIAL*. Banyak alat yang berbeda dapat menghasilkan reaksi torsi saat digunakan, yang berpindah ke tangan dan pergelangan tangan operator..

4

MEMBANTU MENGHINDARI CEDERA terkait pekerjaan dan menciptakan lingkungan yang aman dan nyaman bagi semua karyawan di fasilitas manufaktur



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Just Info ...

Features |

BMW Group prioritises factory digitalisation and ergonomics as workforce ages

One of the many things I enjoy about covering BMW's annual financial results press conference (reports here, here, here and here) is the 'show and tell' side trips – such as the Leipzig i3 'factory within a factory' in 2014. This year, rather than travel to the former east Germany, we needed only to cross the road from BMW Welt in the northern outskirts of Munich to the company's oldest factory – built 'out in the country' in 1922 (to make aero engines, with an airport across the road on what became the 1976 Olympics site), and now landlocked by the much-expanded city, requiring ingenious solutions for further expansion, such as the new paint shop (of which more later).

March 22, 2016



- **Ageing workforce**
- **Exoskeleton 'chairless chair'**
- **ProGloves**
- **Ergonomic workwear**
- ...



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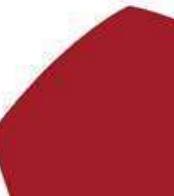


Mengatasi Pekerja yang Menua ... *(Ageing Workforce)*

- usia rata-rata akan segera mencapai 49 tahun
- tetapi pekerja seperti itu layak dipertahankan karena kedewasaan, keandalan, pengetahuan dan keterampilan mereka yang luas,
- akan tetap produktif dan bahagia jika diberi bantuan dengan alat bantu di tempat kerja yang membuat pekerjaan jalur perakitan yang menuntut dan berulang semudah mungkin.
- tempat kerjanya, peralatan, dan proses semuanya dirancang untuk pekerja yang lebih tua dan kurang bergerak dengan ketinggian pengoperasian yang optimal
- tempat penyimpanan peralatan dan suku cadang diposisikan untuk meminimalkan pembengkokan, putaran, dan peregangan
- senyum dan komentar yang ceria, tenaga kerja yang bahagia pun dihasilkan.



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Bagaimana kondisi tempat kerja kita ???

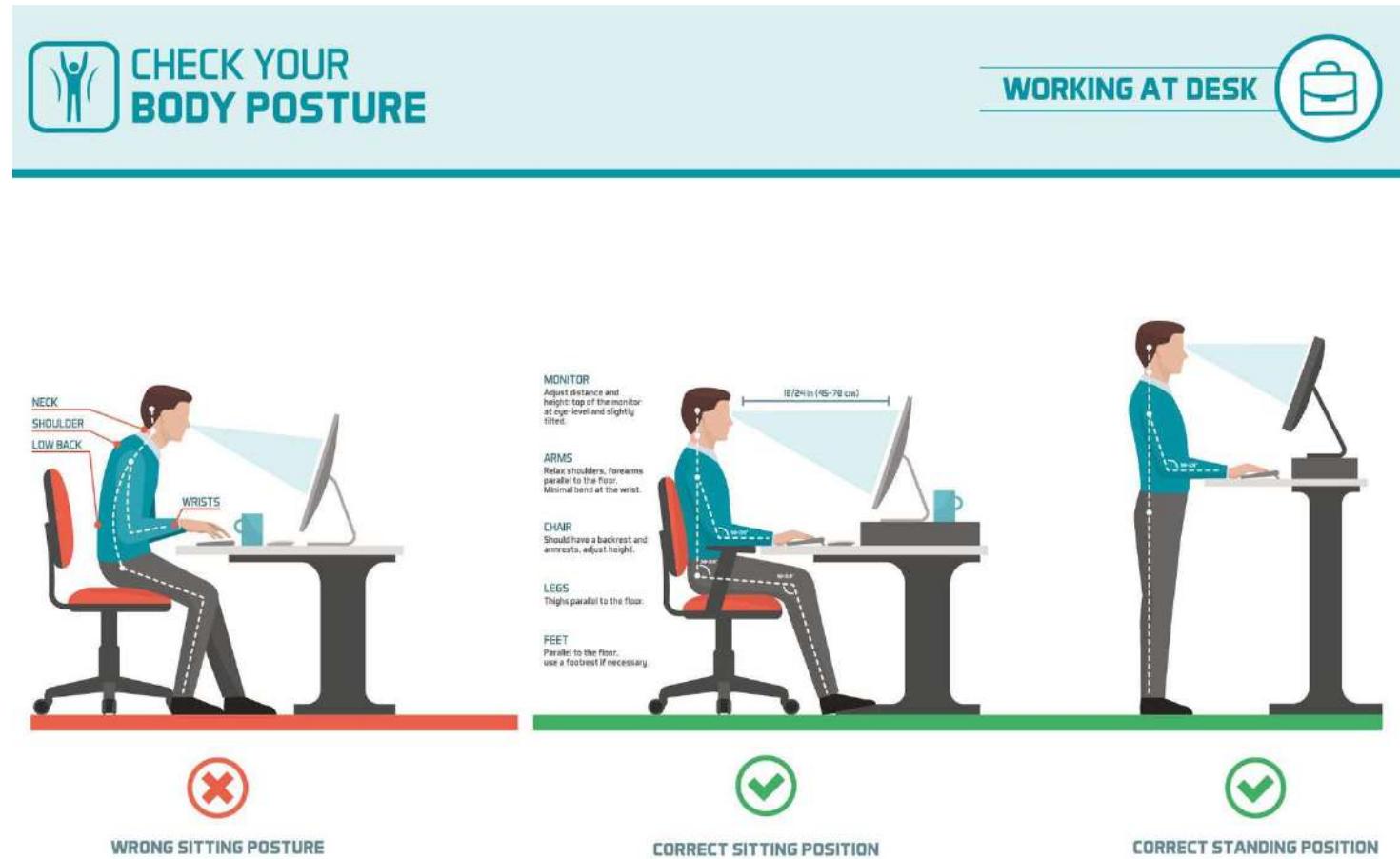
Sudah Ergonomiskah?



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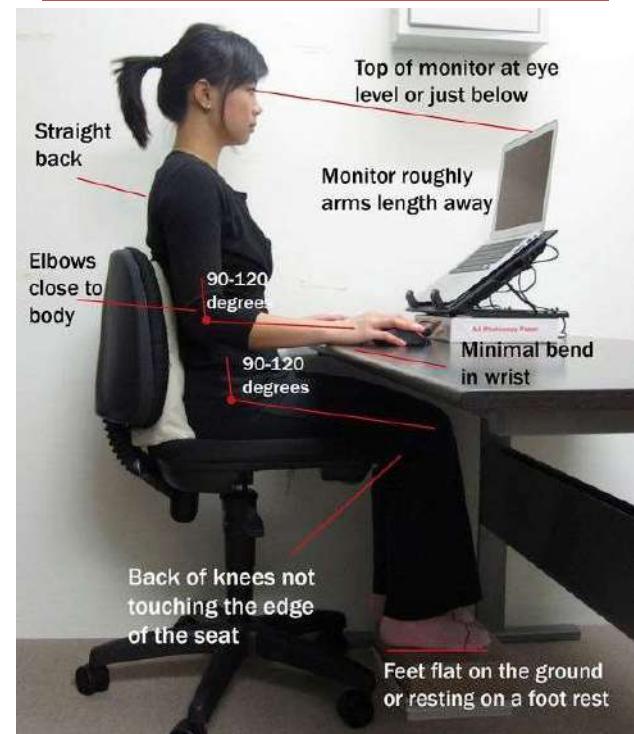
Comfortable Workplace



Problem on sitting



More comfortable Workplace



GOOD DESIGN

Mempertimbangkan berbagai dimensi dan postur tubuh terkait dengan produk



CARA KERJA – POSISI KERJA

berpotensi menjadi penyebab keluhan musculoskeletal



Terdapat bending dan twisting



Posisi Natural



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Terakreditasi
BAN PT
A
(Unggul)

QS STARS
RATING SYSTEM
2019
★★★



IABEE
CPA
AUSTRALIA

ICAEW
CHARTERED
ACCOUNTANTS

CARA KERJA – POSISI KERJA

berpotensi menjadi penyebab keluhan musculoskeletal

Before Ergonomics Improvement



After Ergonomics Improvement



Direct benefit : Fatigue reduction & output increase by approx 5 %

Employees capabilities and Job Demands



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Ergonomic on Manufacturing ...

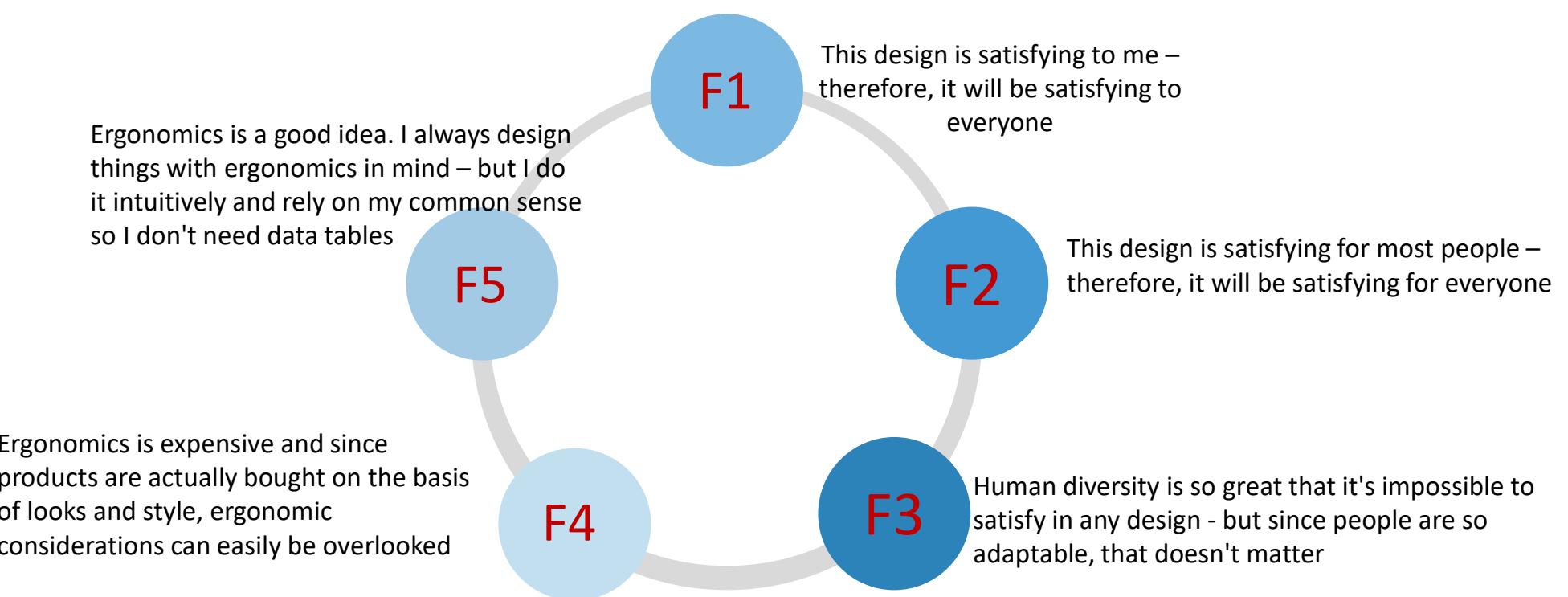


Ergonomic on Manufacturing ...



BIG PROBLEM IN PRODUCT DESIGN -

Five fundamental fallacies about ergonomics – Rainer Gruenen (2020) , Pheasant (1986)





The Secret of Ergonomics

“Adjustability”



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Top 11 Tips for Good Ergonomic Product Design, Paul Skidmore (2022)

- 1 Consider Ergonomics from the Beginning of the Design Process
- 2 Find Your Customer Target before Considering Ergonomics
- 3 Collect Statistical Data from Customers Related to Previous Product Versions
- 4 Look at Competitor Designs for Inspiration and Ergonomic Analysis
- 5 Consider Which Type of Ergonomics Applies to Your Product Design
- 6 Find out the Common Problems Encountered by Customers When Using This Product
- 7 Ensure Your Team that they Understand the Basic Ergonomics
- 8 Define Product Design Goals to Provide Focus and Drive
- 9 Create Product Prototypes to Test Ergonomic Feasibility
- 10 Conventional Design Is Not Always Ergonomic
- 11 Don't compromise to make products that are cheap to produce



Ergonomic Design?



Ergonomic Design?



KOLOM SOSIAL

Inovasi Luar Biasa KAI: Tiang Jemuran di Stasiun

By Celia Citta Irlanie | Jumat, 21 Oktober 2016



detikNews > Berita

Ibu Hamil Keluhkan Kursi 'Jemuran' di Stasiun Pasar Minggu

Mei Amelia R - detikNews
Jumat, 14 Okt 2016 09:18 WIB



Clothesline at the station??



ERGOVATIVE - design ergonomis-innovative



ergovative design





IoT at Home

Setiap hari, sepertinya ada gadget keren lain yang dapat Anda tambahkan ke rumah Anda. Anda bisa mendapatkan bohlam lampu dan saklar lampu yang dapat diprogram sesuai jadwal, perangkat rumah pintar yang memiliki sensor untuk memantau kebocoran air, dan detektor asap yang secara otomatis memberi tahu layanan darurat.

IoT in Business

Banyak bisnis memanfaatkan kekuatan IoT dengan berbagai cara yang kreatif. Mesin industri Rolls-Royce memiliki ratusan sensor yang merekam banyak sekali detail tentang pengoperasian mesin. Sensor-sensor tersebut diprogram untuk melaporkan data yang tidak biasa kepada teknisi yang dapat menentukan apakah mesin tersebut memerlukan perawatan. Perawatan terjadwal memang membantu, tetapi mungkin tidak selalu diperlukan.

IoT and Ergonomics ??

Karena IoT masih tergolong baru, kita belum melihat banyak hal tentang ergonomi. Namun, berdasarkan jenis IoT yang sudah tersedia, mungkin saja Fitbit dapat memberi tahu meja berdiri yang dapat disesuaikan ketinggiannya bahwa Anda sedang mendekatinya, yang menyebabkannya bergerak ke pengaturan yang telah Anda tentukan dan mengatur pencahayaan meja sesuai keinginan Anda.



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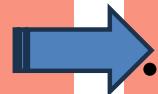


IoTon Ergonomic Application

IoT dapat dimanfaatkan mulai tahap Evaluasi Faktor Risiko Ergonomi sampai dengan Tahap Intervensi

TAHAP EVALUASI

- Evaluasi keluhan pekerja (misanya dengan NBM/QEC)
- Evaluasi Postur Kerja (misalnya dengan RULA/REBA/WERA-terkait Biomekanika)
- Apakah terdapat postur jangkal /tidak natural?
- Apakah terdapat beban berlebihan?



TAHAP INTERVENSI

- Amati data pekerja (jenis kelamin, usia, postur)
- Ambil data anthropometri pekerja, lakukan analisis sampai ketemu persentil
- Atau ambil data anthropometri orang Indonesia (perhatikan jenis kelamin dan usia)
- Lakukan perancangan alat/alat bantu sehingga posisi kerja menjadi natural



Tools analisis Ergonomi dapat dikembangkan dengan algoritma yang memungkinkan analisis REAL TIME

ERGONOMICS

RULA Employee Assessment Worksheet

Task name: _____ Date: _____

A. Arm and Wrist Analysis

Step 1: Locate Upper Arm Position:

Upper Arm Score: **3**

Step 2: Locate Lower Arm Position:

Lower Arm Score: **2**

Step 3: Locate Wrist Position:

Wrist Score: **4**

Step 4: Add Muscle Use Score

If pressure mainly static (i.e. held-10 minutes), Or if action repeated occurs 4x per minute: +1

If load = 4 lbs, or less: +0

If load 4.4 to 22 lbs, (intermittent): +1

If load 4.4 to 22 lbs, (static or repeated): +2

If more than 22 lbs, or repeated or shocks: +3

Step 5: Find Row in Table C

Add values from steps 1-7 to obtain Wrist and Arm Score. Find row in Table C.

Wrist / Arm	Score
1	1
2	2
3	3
4	4
5	5
6	6
7	7

Step 6: Add Muscle Use Score

If pressure mainly static (i.e. held-10 minutes), Or if action repeated occurs 4x per minute: +1

Step 7: Find Row in Table C

Add values from steps 1-7 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Neck, Trunk, Leg	Score
1	1
2	2
3	3
4	4
5	5
6	6
7	7

Step 8: Find Row in Table C

Add values from steps 1-7 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Neck, Trunk, Leg	Score
1	1
2	2
3	3
4	4
5	5
6	6
7	7

Scoring:

- 1 = acceptable posture
- 2 = further investigation, change may be needed
- 3 = further investigation, change soon
- 4 = investigate and implement change

Final score from Table C: **7**

Wrist & Arm Score: **7**

Neck, Trunk, Leg Score: **7**

Wrist and Arm Score: **7**

Neck, Trunk, Leg Score: **7**

Based on RULA's survey method for the investigation of work-related upper limb disorders. McLeanney & Corlett, Applied Ergonomics, 1993, 24(3), 91-99

REBA Employee Assessment Worksheet

Based on Technical note: Rapid Entire Body Assessment (REBA). Hamer, McLeanney, Applied Ergonomics, 31 (2000), 201-202

A. Neck, Trunk and Leg Analysis

Step 1: Locate Neck Position:

Neck Score: **3**

Step 2: Locate Trunk Position:

Trunk Score: **2**

Step 3: Locate Legs:

Leg Score: **1**

Step 4: Adjust:

If neck is twisted: +1
If neck is side bending: +1
If neck is raised: +1
If neck is lowered: -1
If neck is side bending: -1

Step 5: Look-up Posture Score in Table B:

Using values from steps 1-3 above, locate score in Table A

Wrist / Arm	Score
1	1
2	2
3	3
4	4
5	5
6	6
7	7

Step 6: Add Force/Load Score

If load = 4 lbs, different: +0
If load 4.4 to 22 lbs, (intermittent): +1
If load 4.4 to 22 lbs, (static or repeated): +2
If more than 22 lbs, or repeated or shocks: +3

Step 7: Locate Upper Arm Position:

Upper Arm Score: **2**

Step 8: Locate Lower Arm Position:

Lower Arm Score: **1**

Step 9: Locate Wrist Position:

Wrist Score: **2**

Step 10: Look-up Posture Score in Table B

Using values from steps 7-9 above, locate score in Table B

Legs	1	2	3
1	1	2	3
2	2	3	4
3	3	4	5
4	4	5	6
5	5	6	7
6	6	7	8
7	7	8	9
8	8	9	10
9	9	10	11
10	10	11	12
11	11	12	-
12	12	12	-

Step 11: Add Coupling Score

If hand held -11 lbs: +0
If load 11 to 22 lbs: +1
If load > 22 lbs: +2
Adjust: If shock or rapid build up of force: +1

Step 12: Score A, Find Row in Table C

Add values from steps 4-8 to obtain Score A. Find Row in Table C

Score A (Posture Score + Coupling Score)	Score B (same as score in Table B)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12

Step 13: Activity Score

1 = negligible risk
2 = low risk, change may be needed
4 to 7 = medium risk, further investigation, change soon
8 to 10 = high risk, investigate and implement change
11+ = very high risk, implement change

Step 14: Add Force/Load Score

If load = 4 lbs, different: +0
If load 4.4 to 22 lbs, (intermittent): +1
If load 4.4 to 22 lbs, (static or repeated): +2
If more than 22 lbs, or repeated or shocks: +3

Step 15: Find Column in Table C

Add values from steps 10-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Score A	Score B	Score C (Score A + Score B + Force/Load Score)
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12

Step 16: Final REBA Score

Final REBA Score: **7**

Task name: _____ Reviewer: _____ Date: _____

This tool is provided without warranty. The author has provided this tool as a simple means for applying the concepts provided in REBA.

provided by Practical Ergonomics
rbarke@ergo.com (816) 444-1667



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Tools analisis Ergonomi dapat dikembangkan dengan algoritma yang memungkinkan analisis REAL TIME

WERA – WORKPLACE ERGONOMICS RISK ASSESSMENT

WORKPLACE ERGONOMIC RISK ASSESSMENT (WERA)																															
PHYSICAL RISK FACTOR	LOW	MEDIUM	HIGH	RISK LEVEL	SCORING SYSTEM																										
1. Shoulder	1a. Posture				3a. POSTURE	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6									
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Never	2	3	4																												
Less than once a week	3	4	5																												
More than once a week	4	5	6																												
1b. Repetition	Light movement with more pauses	Moderate movement with some pauses	Heavy movement with no rest	3b. REPETITION	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6										
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2. Wrist	2a. Posture				3a. POSTURE	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6									
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More than once a week	4	5	6																												
2b. Repetition	0-10 times per minute	11-20 times per minute	Over 20 times per minute	3b. REPETITION	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6										
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3. Back	3a. Posture				3a. POSTURE	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6									
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3b. Repetition	0-3 times per minute	4-8 times per minute	9-32 times per minute	3b. REPETITION	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6										
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5. Leg	5a. Posture				5a. POSTURE	<table border="1"> <tr> <td>Not used</td> <td>Low</td> <td>Med</td> <td>High</td> </tr> <tr> <td>Never</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Less than once a week</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>More than once a week</td> <td>4</td> <td>5</td> <td>6</td> </tr> </table>	Not used	Low	Med	High	Never	2	3	4	Less than once a week	3	4	5	More than once a week	4	5	6									
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Note:- WERA: An observational tool developed to investigate the physical risk factors associated with WERAS, and its initial validity, Arie Boerdje Krikke and John Muhsin Fekken, Journal of Human Ergology, JHE, 40(2), 19-26



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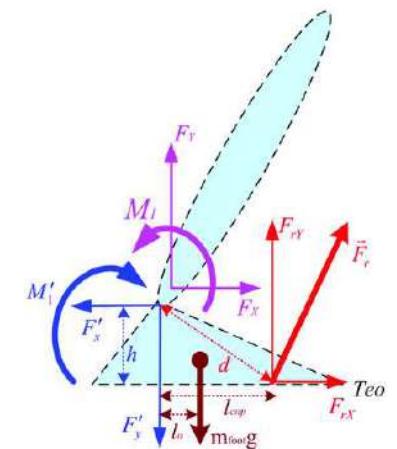
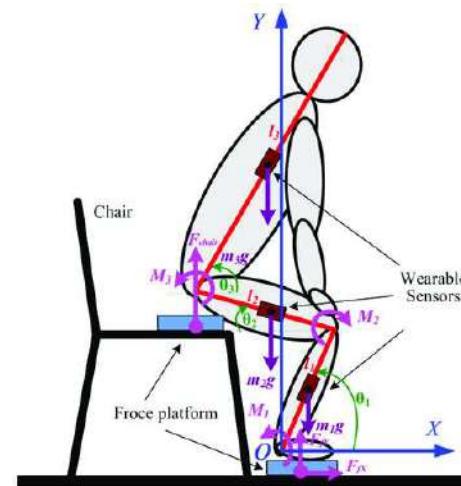
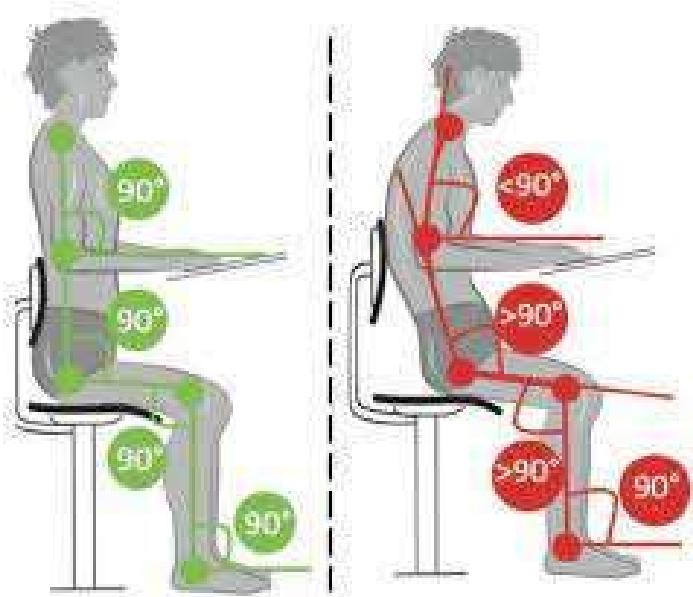


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BIOMECHANIC and PRODUCT DESIGN

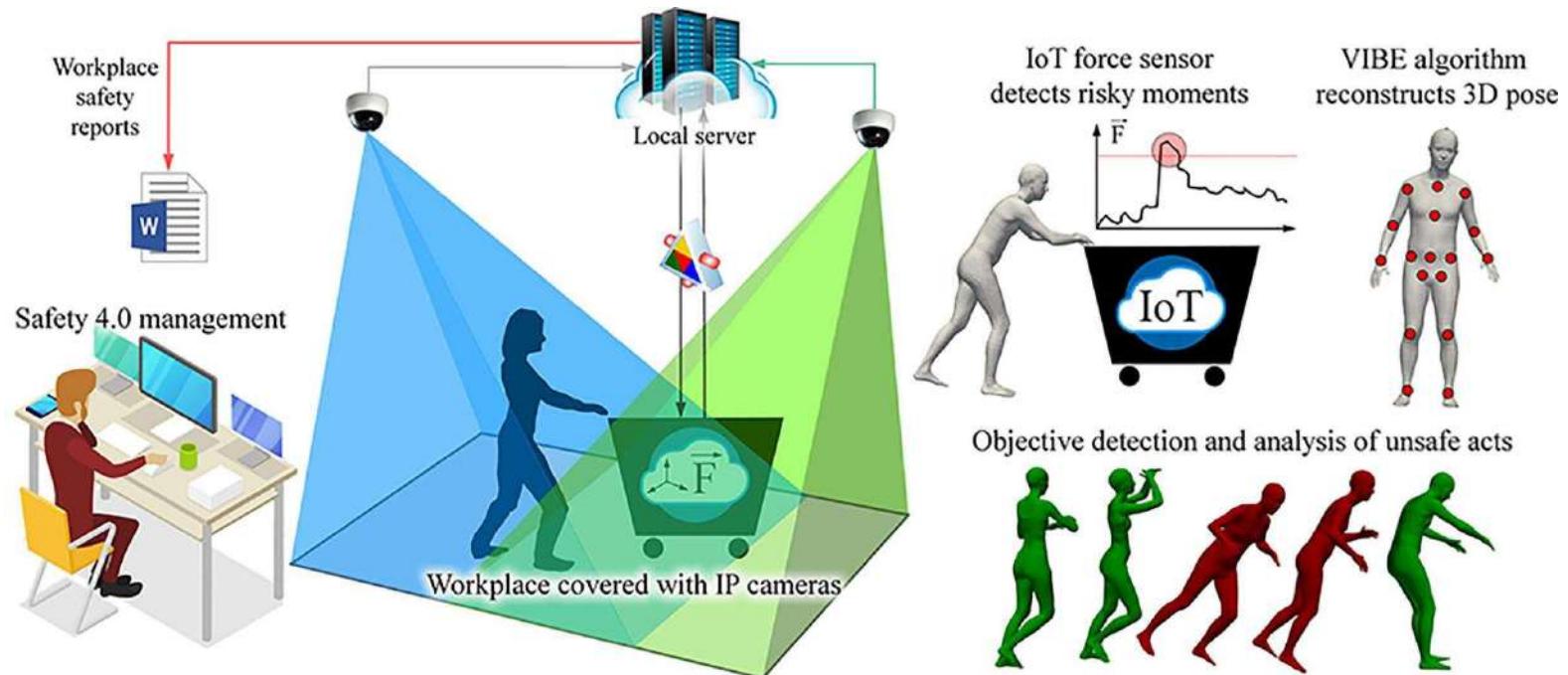
Each design must ensure that when used, the posture is in a natural position, there is no excessive load on certain muscles.





Assessment of the handcart pushing and pulling safety by using deep learning 3D pose estimation and IoT force sensors

Arso M. Vukicevic ^{a,1}, Ivan Macuzic ^{a,2}, Nikola Mijatovic ^{a,3}, Aleksandar Peulic ^{b,4},
Milos Radovic ^{c,5}



JURNAL ILMIAH TEKNIK INDUSTRI

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Journal homepage: <http://journals.ums.ac.id/index.php/jiti/index>

doi: 10.23917/jiti.v22i2.22561

Adaptation of Internet of Things Technology to Measure Energy Consumption Levels to Reduce Ergonomics-Based Work Accidents

Intan Berlianty^{1a♦}, Irwan Soejanto^{1b}, Indun Titisariwati^{1c}, Eko Nursubiyantoro^{1d}, Miftahol Arifin^{2e}

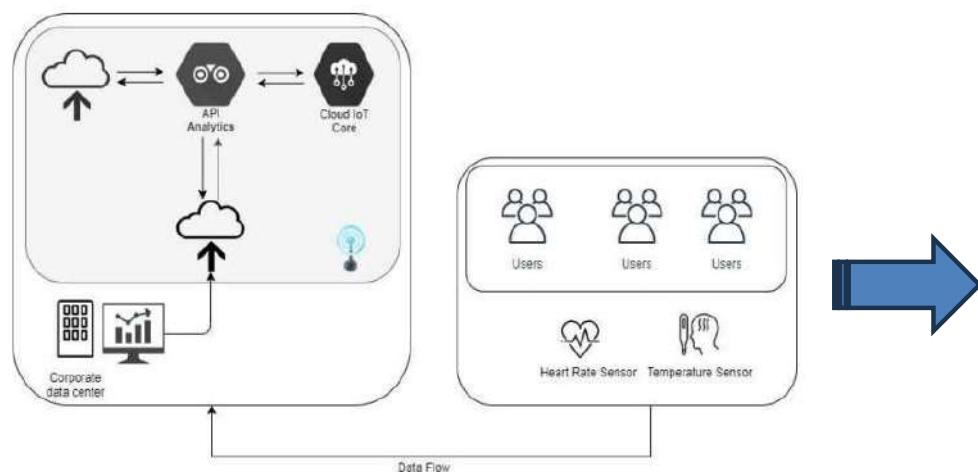


Figure 1. IoT Ergonomic System Design



Figure 4. User interface display



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BODY-CASE

Small enclosure with flair – comfortable to wear on the body

APPLICATION FIELDS

- Mobile data recording and data transmission
- Wearables
- IoT/ IIoT
- Tracking and monitoring equipment
- Emergency call and notification systems
- Bio-feedback sensors in the fields of health care, medical technology, in therapeutic and social fields
- Leisure and sports
- Digital communication technology
- Stock and sales logging
- Safety engineering
- Measuring and control technology
- Automation
- Jobs where safety with permanent localisation is required



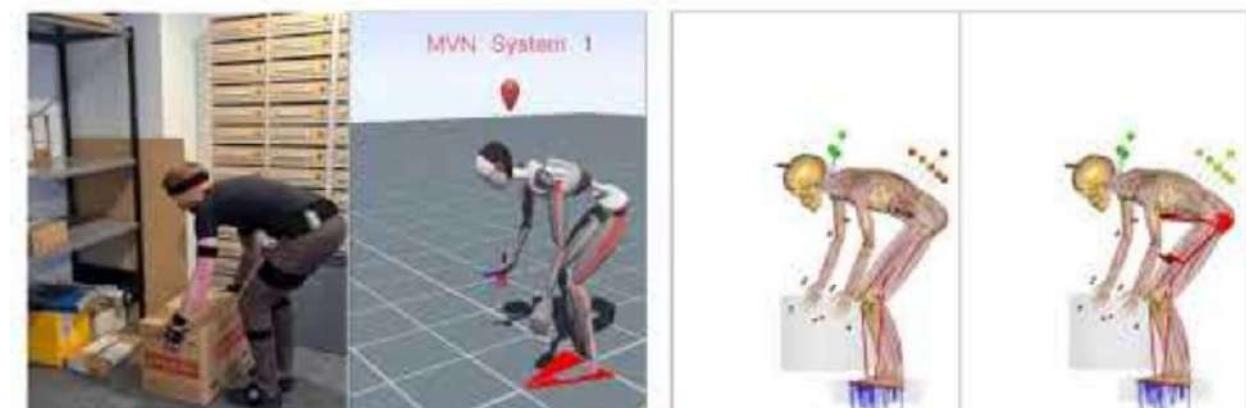
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Mari lihat sejenak

Workplace analysis with simulation driven ergonomic assessment

Extend your output from traditional ergonomic assessment standards along with biomechanical parameters as muscle activity and forces, joint reaction forces and metabolism



An NV logo and text indicating funding from the European Union's Horizon 2020 research and innovation programme.

Project: Enhancing Ergonomic Workstation in Manufacturing Environments (ErgoWork)

imko ANYBODY TECHNOLOGY

thank you!



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