Value Proposition Map and customer profile based on the results from the Exskallerate project (28-03-2023).

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This is an overview of the empirical data collected through Exskallerate and the collaborating partners. The overview will try to fit a value proposition map to a customer profile in order to highlight key learnings, challenges and end-user expectations (Osterwalder et al., 2014). As such, both the value map and the customer profile are generated based on the available data and collaborating companies, and not on the ideal value propositions or broad range of potential and relevant customer profiles, which could have been recruited for the pilot tests.

At the time of writing, 29 companies have participated (or confirmed their participation) in the Exskallerate project. Based on these preliminary results, we conclude that, while some companies report on multiple experienced gains, currently there does not exist a perfect fit between all the value proposition elements and the customer profile when it comes to the tested exoskeletons and participating end-users. Especially, *reduced mobility*, *hindered movement for specific tasks*, and *discomfort* are reported as main pain points. Additionally, concerns were raised in some pilot tests that the exoskeleton did not fit within the high variation of work tasks that real-world applications entail (e.g. within bricklaying (Skelex), poor fit for mounting metal studs and gypsum wall panels (Laevo; Auxivo); and only useful for very specific tasks on a daily basis (Eksovest; Ottobock BackX)). This implies that the current state of the exoskeletons used were either tested in mismatched working environments, or, that the exoskeletons themselves lack the flexibility needed to properly be utilized in real-world work environments.

However, the exoskeleton pilot tests reveal that the *experienced reduction of physical load and fatigue* reported by the participants are quite high. Despite an apparent mismatch in many pilot cases, 14 out of 21 companies report that they are interested in acquiring exoskeletons in the future.

Value proposition map

A value proposition map breaks down the specific features of a value proposition, i.e., what value do exoskeletons bring to end-users in real work-environments? It consists of:

- *Products and services:* In this case, the various exoskeletons empirically tested so far in the Exskallerate project.
- *Gain Creators:* A description of the expected gains of exoskeleton use in the collaborating companies, who tested an exoskeleton in their work-environment.
- *Pain relievers:* A description of which alleviated pains are expected from exoskeleton use in the collaborating companies

The following sections will go through each of the points in the value map.

Products and services

In total 6 (8?) different Exoskeletons have been tested:

Exoskeleton	*Number of tests*	*Company*	*Reported level of satisfaction with exoskeleton*
Auxivo	2	Van Berlo (NL); Indeglass (NL)	Good; N/A
Eksovest	4	Industriprofil (SE); Takringen (SE); Pars-BTT; Group (SE); Picea Bygg (SE)	Good; Good; Poor; Very Good
Hilti/Ottobock	1	Aqua (NL)	Good
Laevo	6	Muremester Martin Riise (DK); Hankamp Gears (NL); Van Berlo (NL); Gepla (NL); Moes Infra (NL); Potier Stone (BE)	Poor; Moderate; Good; Moderate; Poor; Moderate
'Ottobock'	1	Mitsubishi Chemical Advanced Materials (NL)	Moderate
Ottobock (BackX)	1	Pars-BTT Group (SE)	Poor
Ottobock (Paexo Back)	4	Einbecker Brauhaus AG (DE); RACK & RÜTHER GmbH (DE); Pulverbeschichtung Schreiner GmbH & Co KG (DE); F.A. Schreyer GmbH (DE)	Moderate; Moderate; Good; Good
Skelex	9	Muremester Martin Riise (DK); HMK Bilcon (DK); Aqua (NL); Firestopholland (NL); JKF Industri (DK); Soren Kvists Auto (DK); Byggefirmaet Staun A/S (DK); eL-Tec B.V. (NL); Bouwlinq (NL)	Poor; Very Good; Good; Very Good; Good; Good; Good; N/A; N/A

Table 1. Overview of exoskeletons used and in which companies

The Skelex exoskeleton has appeared in most pilot tests, followed by Laevo, Ottobock Paexa Back and Eksovest. The four most tested have been mapped out in the following where it appears that Skelex has received the highest reported satisfaction level (keep in mind, still, the low sample size):

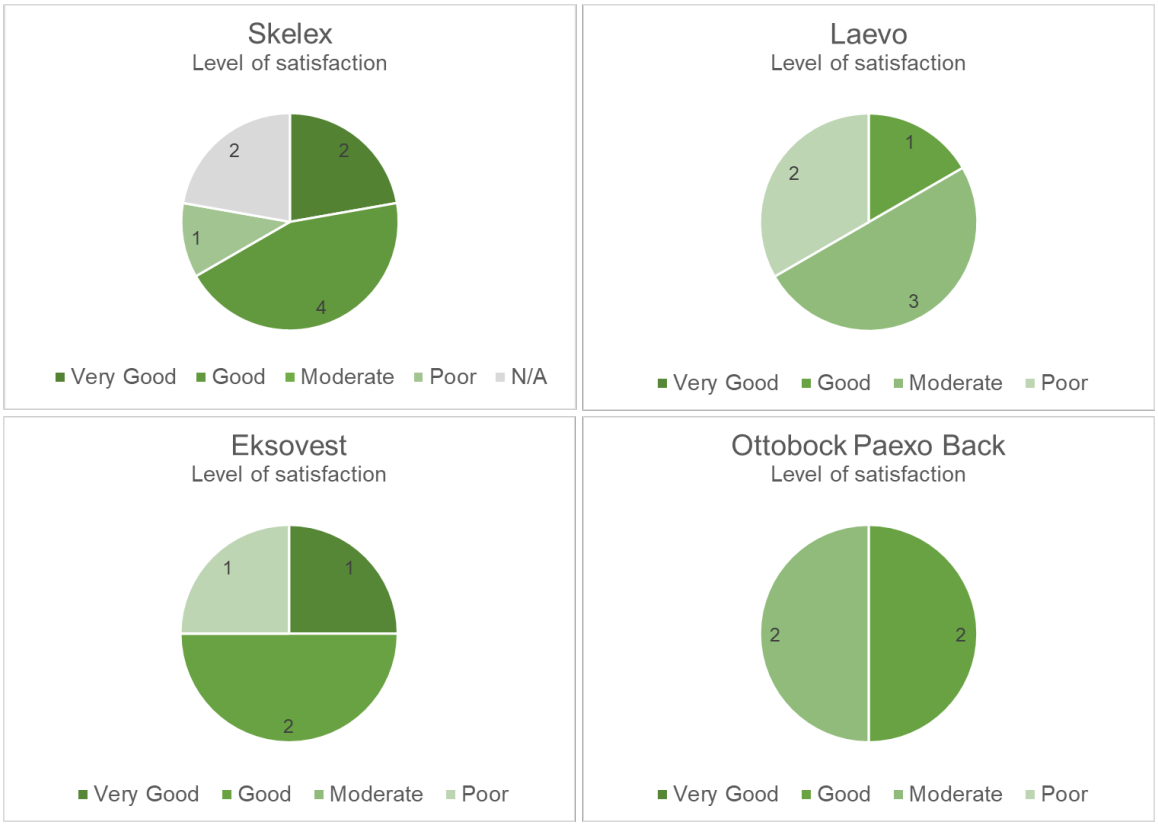

Figure 1. How Skelex, Laevo, Eksovest and Ottobock Paexo Back were reported on the expereinced level of satosfaction with the exoskeletons

Pain relievers

It is expected that the use of exoskeletons in the companies will help reduce aching joints and muscle fatigue during their daily work tasks:

- Reduction of physical load on workers
- Reduction of physical discomfort and fatigue of workers
- Reduction in work-related pain or injury
- Reduction in sick leave

Gain creators

It is expected that the use of exoskeletons will contribute to:

- Increase in job satisfaction / job attractiveness
- Increase in turnover within the company
- Increase in productivity

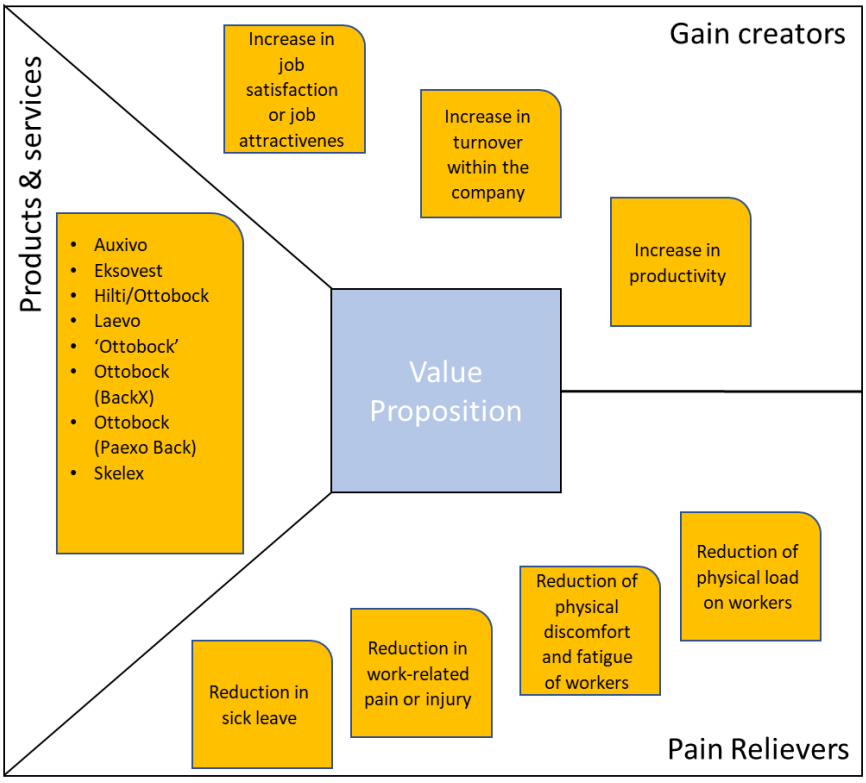

Figure 2. Value Proposition Map

Customer profile

This section intends to break down the customer segment, which have been targeted by the Exskallerate projects. It will provide an overall description of the experienced gains, pains and customer jobs, which has been derived from the Exskallerate feedback forms. It comprises of three elements:

- *Customer jobs:* Describes the different job tasks that the companies have tested the exoskeletons within.
- *Pains:* The pains experienced and expressed by the collaborating companies based on the feedback forms.
- *Gains:* The gains experienced and expressed by the collaborating companies based on the feedback forms.

Customer jobs

- Construction site: Installation of plaster panels in ceiling (power tool + heavy work above head height)

Pains & Gains

Company	*Pains*	*Gains*	*Exoskeleton*	*Additional comments*
Einbecker Brauhaus AG (DE)	Discomfort or pressure points; Reduced mobility; Subject hollow back	Increase in job satisfaction / job attractiveness	Ottobock (Paexo Back)	Problem: Locking mechanism. Back must be stretched backwards to change to active/passive mode
RACK & RÜTHER GmbH (DE)	Reduced mobility; Hindrance during specific activities	N/A	Ottobock (Paexo Back)	We had expected more support from the exoskeleton (only up to hip height). Support to eyen level is needed.
Pulverbeschichtung Schreiner GmbH & Co KG (DE)	Reduced mobility	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Increase in job satisfaction / job attractiveness; Reduction in work-related pain or injury; Increase in productivity	Ottobock (Paexo Back)	4 exos for 8 workers
F.A. Schreyer GmbH (DE)	Discomfort or pressure points in certain body areas; Hindrance during specific activities	Reduction of physical load on workers	Ottobock (Paexo Back)	Pressure points on the thighs due to low padding.
Muremester Martin Riise (DK)	Discomfort or pressure points in certain body areas; Hindrance during specific activities	N/A	Laevo; Skelex	Does not fit for their kind of work
Industriprofil (SE)	Discomfort or pressure points in certain body areas; Reduced mobility; Hindrance during specific activities	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Increase in job satisfaction / job attractiveness; Reduction in work-related pain or injury; Reduction in sick leave; Increase in productivity	Eksovest	"I can do movements without pain in my shoulder for the first time in years."

HMK Bilcon (DK)	Amount of time to put on/off	Reduction of physical load on workers; Reduction in work-related pain or injury; Reduction in sick leave	Skelex	Considering it for 5-10 workers
Takringen (SE)	Discomfort or pressure points in certain body areas; Reduced mobility; Amount of time to put on/off Hindrance during specific activities	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Reduction in work-related pain or injury; Reduction in sick leave; Increase in productivity	Eksovest	Useful but bulky
Pars-BTT Group (SE)	Reduced mobility	Reduction of physical load on workers	Eksovest; Ottobock (BackX)	Only useful for very specific tasks on a daily basis
Hankamp Gears (NL)	Discomfort or pressure points in certain body areas; Reduced mobility	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers	Laevo	Management convinced, staff not
Van Berlo (NL)	Hindrance during specific activities	Reduction of physical load on workers	Laevo; Auxivo	*N/A*
Gepla (NL)	*N/A*	*N/A*	Laevo; Auxivo	Not the right fit for mounting metal stud and gypsum walls.
Aqua (NL)	Discomfort or pressure points in certain body areas; Reduced mobility	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Reduction in work-related pain or injury	Skelex; Hilti/Ottobock	Adoption in industry takes time
Firestopholland (NL)	Hindrance during specific activities	Reduction of physical load on workers	Skelex	Would definitely purchase for the employee who wants to use it. Might also become a standard part of the tool set in the future.
JKF Industri (DK)	*N/A*	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers	Skelex	*N/A*
Picea Bygg (SE)	Lack of feeling of support; Discomfort or pressure points in certain body areas; Reduced mobility; Amount of time to put on/off Hindrance during specific activities	Reduction of physical load on workers	Eksovest	*N/A*
Mitsubishi Chemical Advanced Materials (NL)	*N/A*	*N/A*	Ottobock	Currently investigating other tasks where exoskeletons could be useful
Soren Kvists Auto (DK)	Hindrance during specific activities	Reduction of physical load on workers	Skelex	*N/A*
Belgosuc (BE)	*N/A*	*N/A*		*N/A*

Potier Stone (BE)	Reduced mobility; Hindrance during specific activities	Reduction of physical load on workers	Laevo	Some people found it harder to do some tasks that required flexibility. Some people clinged on to objects from time to time (bulkiness)
Byggefirmaet Staun A/S (DK)	Reduced mobility	Reduction of physical load on workers	Skelex	Uncomfortability in some situations. Too much support/assistance

Table 2. overview of experienced pains and gains. Note: Ecosystem Technologies (UK), Kenoteq (UK), Indeglass (NL), Moes Infra (NL), Belgosuc (BE), Verstraete NV (BE), Tectum Group (BE), eL-Tec B.V. (NL), and Bouwlinq (NL) are missing from this overview due to missing/unavailable data.

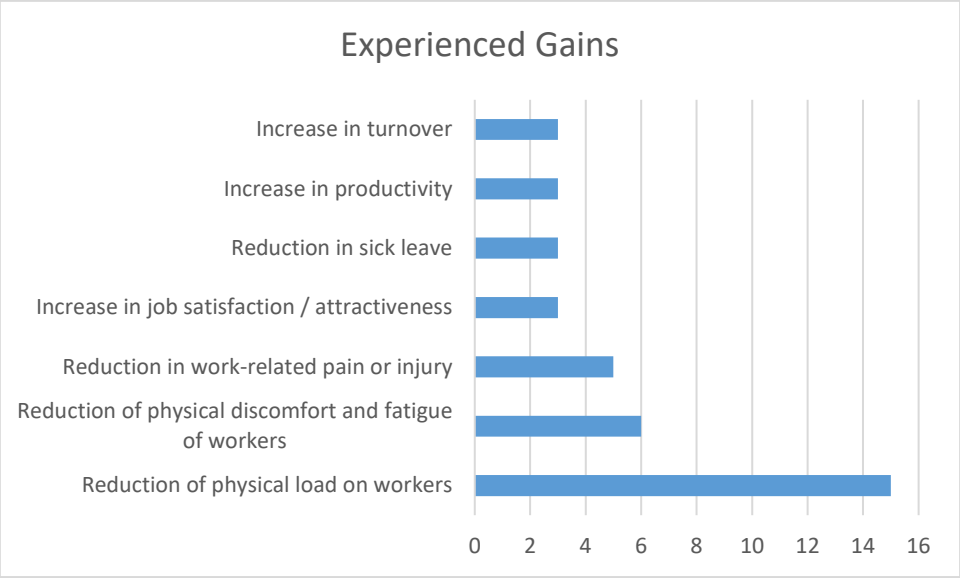

Figure 3. Total experienced gains by the end-users

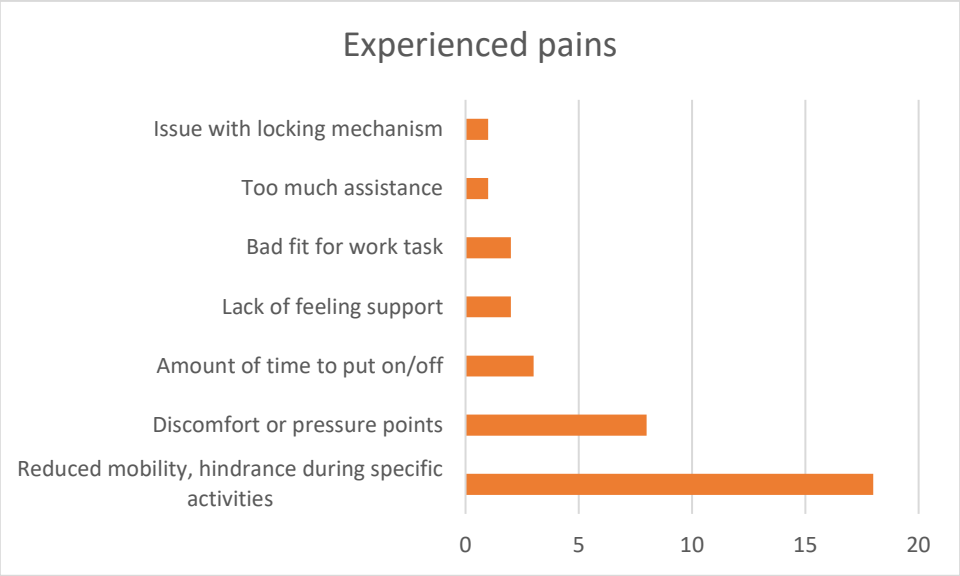

Figure 4. Total experienced pains by the end-users

Figure 5. Customer profile map based on their reported experiences

Fit between value proposition and customer map

To determine whether a fit exists between the value proposition map and the customer profile, an overall analysis have been conducted. The green checkmarks (✓) denotes a fit between the expected outcomes reported on the application forms and the reported outcomes from the feedback forms. The orange color denotes a weak fit, meaning, very few companies reported on these topics. The red (X's) denote areas experienced by the companies, which do not fit the initial gains creators or pain relievers listed in the value proposition map. There has been made no distinction between commonly experienced mismatches and a single comment – the focus was just on highlighting the different types of mismatches found.

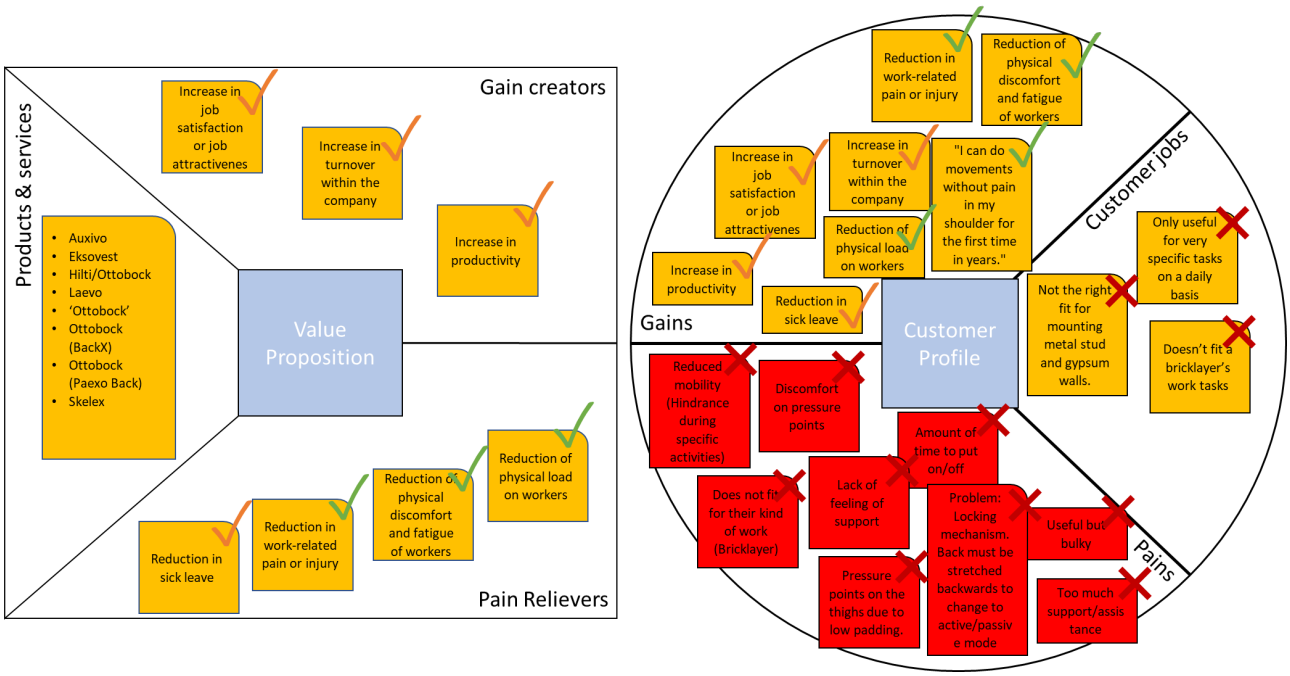

Table 3. Overview of results collected through the evaluation forms.

Despite the reported mismatch, the majority of the companies (*N = 21)* express that they are considering exoskeletons for their work environment in the future.

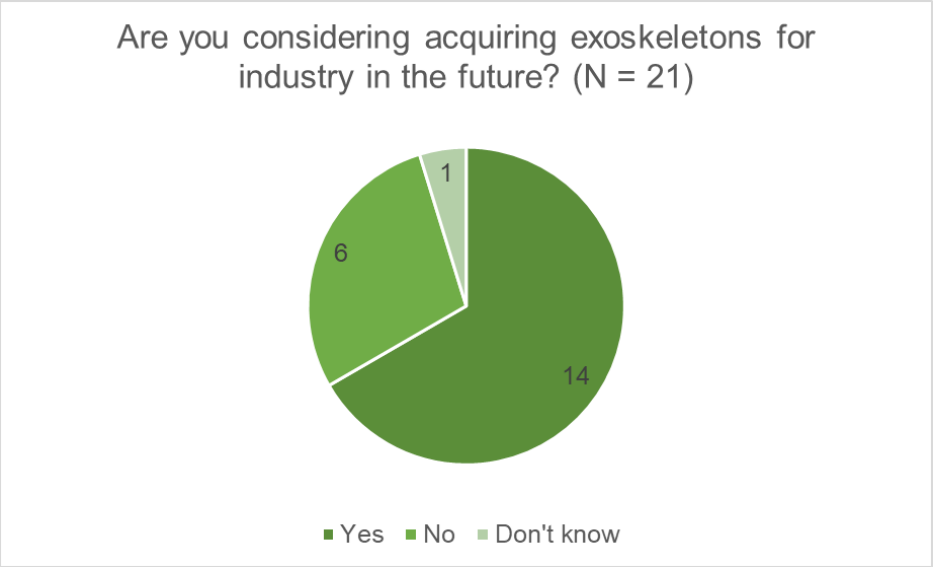

Figure 6. Data was available for 21 out of the 29 companies. 14 consider acquiring exoskeletons in their work environments.

Literature

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2014). *Value proposition design: How to create products and services customers want*. John Wiley & Sons.

	SME	*Exoskeleton*	*Level of satisfaction*	*Productivity increase noticed (%)*	*Turnover increase noticed (%)*	*If widely adopted in company: Expected effect on turnover (long term)*	*Experienced benefits in daily workers' tasks*	*Have workers experienced any inconveniences in their daily tasks?*	*Considers acquiring exoskeletons for industry in the future?*
1	**Einbecker Brauhaus AG (DE)**	Ottobock (Paexo Back)	Moderate	30%	0%	0%	Increase in job satisfaction / job attractiveness	Discomfort or pressure points; Reduced mobility; Subject hollow back	No
2	**RACK & RÜTHER GmbH (DE)**	Ottobock (Paexo Back)	Moderate	0%	0%	0%	*N/A*	Reduced mobility; Hindrance during specific activities	No
3	**Pulverbeschichtung Schreiner GmbH & Co KG (DE)**	Ottobock (Paexo Back)							
4	**F.A. Schreyer GmbH (DE)**	Ottobock (Paexo Back)	Good	0%	0%	0%	Reduction of physical load on workers	Discomfort or pressure points in certain body areas; Hindrance during specific activities	Yes
5	**Muremester Martin Riise (DK)**	Laevo; Skelex	Poor	0%	0%	0%	*N/A*	Discomfort or pressure points in certain body areas; Hindrance during specific activities	No
6	**Industriprofil (SE)**	Eksovest	Good	*N/A*	0%	15%	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Increase in job satisfaction / job attractiveness; Reduction in work-related pain or injury; Reduction in sick leave; Increase in productivity	Discomfort or pressure points in certain body areas; Reduced mobility; Hindrance during specific activities	Yes
7	**HMK Bilcon (DK)**	Skelex	Very good	0%	0%	0%	Reduction of physical load on workers; Reduction in work-related pain or injury; Reduction in sick leave	Amount of time to put on/off	Yes
8	**Takringen (SE)**	Eksovest	Good	20%	0%	20%	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Reduction in work-related pain or	Discomfort or pressure points in certain body areas; Reduced mobility; Amount of time to put	Yes

							injury; Reduction in sick leave; Increase in productivity	on/off Hindrance during specific activities	
9	**Pars-BTT Group (SE)**	Eksovest; Ottobock (BackX)	Poor	2%	0%	0%	Reduction of physical load on workers	Reduced mobility	Yes
10	**Ecosystem Technologies (UK)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
11	**Kenoteq (UK)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
12	**Hankamp Gears (NL)**	Laevo	Moderate	5%	0%	10%	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers	Discomfort or pressure points in certain body areas; Reduced mobility	Yes
13	**Van Berlo (NL)**	Laevo; Auxivo	Good	0%	0%	0%	Reduction of physical load on workers	Hindrance during specific activities	Yes
14	**Indeglass (NL)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
15	**Gepla (NL)**	Laevo; Auxivo	Moderate	0%	0%	0%	*N/A*	*N/A*	No
16	**Aqua (NL)**	*Skelex; Hilti/ Ottobock*	Good	*0%*	*0%*	*0%*	*Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Reduction in work-related pain or injury*	*Discomfort or pressure points in certain body areas; Reduced mobility*	Yes
17	**Firestopholland (NL)**	Skelex	Very good	0%	0%	0%	Reduction of physical load on workers	Hindrance during specific activities	Yes
18	**JKF Industri (DK)**	Skelex	Good	*N/A*	*N/A*	*N/A*	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers		Yes
19	**Picea Bygg (SE)**	Eksovest	Very good	0%	0%	0%	Reduction of physical load on workers	Lack of feeling of support; Discomfort or pressure points in certain body areas; Reduced mobility; Amount of time to put on/off Hindrance during specific activities	Yes
20	**Moes Infra (NL)**	Laevo	Poor	0%	0%	0%	*N/A*	*N/A*	Don't know
21	**Mitsubishi Chemical Advanced Materials (NL)**	Ottobock	Moderate	0%	0%	0%	*N/A*	*N/A*	Yes
22	**Soren Kvists Auto (DK)**	Skelex	Good	0%	0%	0%	Reduction of physical load on workers	Hindrance during specific activities	No
23	**Belgosuc (BE)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

24	**Potier Stone (BE)**	Laevo	Moderate	*N/A*	*N/A*	*N/A*	Reduction of physical load on workers	Reduced mobility; Hindrance during specific activities	Yes
25	**Verstraete NV (BE)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
26	**Tectum Group (BE)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
27	**Byggefirmaet Staun A/S (DK)**	Skelex	Good	0%	0%	0%	Reduction of physical load on workers	Reduced mobility	No
28	**eL-Tec B.V. (NL)**	Skelex	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
29	**Bouwlinq (NL)**	Skelex	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

	SME	*Exoskeleton*	*Level of satisfaction*	*Productivity increase noticed (%)*	*Turnover increase noticed (%)*	*If widely adopted in company: Expected effect on turnover (long term)*	*Experienced benefits in daily workers' tasks*	*Have workers experienced any inconveniences in their daily tasks?*	*Considers acquiring exoskeletons for industry in the future?*
1	**Einbecker Brauhaus AG (DE)**	Ottobock (Paexo Back)	Moderate	30%	0%	0%	Increase in job satisfaction / job attractiveness	Discomfort or pressure points; Reduced mobility; Subject hollow back	No
2	**RACK & RÜTHER GmbH (DE)**	Ottobock (Paexo Back)	Moderate	0%	0%	0%	*N/A*	Reduced mobility; Hindrance during specific activities	No
3	**Pulverbeschichtung Schreiner GmbH & Co KG (DE)**	Ottobock (Paexo Back)							
4	**F.A. Schreyer GmbH (DE)**	Ottobock (Paexo Back)	Good	0%	0%	0%	Reduction of physical load on workers	Discomfort or pressure points in certain body areas; Hindrance during specific activities	Yes
5	**Muremester Martin Riise (DK)**	Laevo; Skelex	Poor	0%	0%	0%	*N/A*	Discomfort or pressure points in certain body areas; Hindrance during specific activities	No
6	**Industriprofil (SE)**	Eksovest	Good	*N/A*	0%	15%	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Increase in job satisfaction / job attractiveness; Reduction in work-related pain or injury; Reduction in sick leave; Increase in productivity	Discomfort or pressure points in certain body areas; Reduced mobility; Hindrance during specific activities	Yes
7	**HMK Bilcon (DK)**	Skelex	Very good	0%	0%	0%	Reduction of physical load on workers; Reduction in work-related pain or injury; Reduction in sick leave	Amount of time to put on/off	Yes
8	**Takringen (SE)**	Eksovest	Good	20%	0%	20%	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Reduction in work-related pain or injury;	Discomfort or pressure points in certain body areas; Reduced mobility; Amount of time to put on/off	Yes

							Reduction in sick leave; Increase in productivity	Hindrance during specific activities	
9	**Pars-BTT Group (SE)**	Eksovest; Ottobock (BackX)	Poor	2%	0%	0%	Reduction of physical load on workers	Reduced mobility	Yes
10	**Ecosystem Technologies (UK)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
11	**Kenoteq (UK)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
12	**Hankamp Gears (NL)**	Laevo	Moderate	5%	0%	10%	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers	Discomfort or pressure points in certain body areas; Reduced mobility	Yes
13	**Van Berlo (NL)**	Laevo; Auxivo	Good	0%	0%	0%	Reduction of physical load on workers	Hindrance during specific activities	Yes
14	**Indeglass (NL)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
15	**Gepla (NL)**	Laevo; Auxivo	Moderate	0%	0%	0%	*N/A*	*N/A*	No
16	**Aqua (NL)**	*Skelex; Hilti/ Ottobock*	Good	*0%*	*0%*	*0%*	*Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers; Reduction in work-related pain or injury*	*Discomfort or pressure points in certain body areas; Reduced mobility*	Yes
17	**Firestopholland (NL)**	Skelex	Very good	0%	0%	0%	Reduction of physical load on workers	Hindrance during specific activities	Yes
18	**JKF Industri (DK)**	Skelex	Good	*N/A*	*N/A*	*N/A*	Reduction of physical load on workers; Reduction of physical discomfort and fatigue of workers		Yes
19	**Picea Bygg (SE)**	Eksovest	Very good	0%	0%	0%	Reduction of physical load on workers	Lack of feeling of support; Discomfort or pressure points in certain body areas; Reduced mobility; Amount of time to put on/off Hindrance during specific activities	Yes
20	**Moes Infra (NL)**	Laevo	Poor	0%	0%	0%	*N/A*	*N/A*	Don't know
21	**Mitsubishi Chemical Advanced Materials (NL)**	Ottobock	Moderate	0%	0%	0%	*N/A*	*N/A*	Yes
22	**Soren Kvists Auto (DK)**	Skelex	Good	0%	0%	0%	Reduction of physical load on workers	Hindrance during specific activities	No
23	**Belgosuc (BE)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

24	**Potier Stone (BE)**	Laevo	Moderate	*N/A*	*N/A*	*N/A*	Reduction of physical load on workers	Reduced mobility; Hindrance during specific activities	Yes
25	**Verstraete NV (BE)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
26	**Tectum Group (BE)**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
27	**Byggefirmaet Staun A/S (DK)**	Skelex	Good	0%	0%	0%	Reduction of physical load on workers	Reduced mobility	No
28	**eL-Tec B.V. (NL)**	Skelex	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
29	**Bouwlinq (NL)**	Skelex	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 4. Overview of the available data collected so far. Note, however, how many fields are missing data at this point.

Analysis of the industrial value-stream for exoskeletons in Denmark

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In the following, we have developed an overview of the value stream for exoskeletons in Denmark.

Exoskeletons are in general not very widespread in Danish industry. The use of exoskeletons is mainly aids for individuals where injuries have already occurred. The focus of exoskeleton sales in Denmark is mainly prevention of work place injuries.

SALES	– Exoskeletter.dk – Immodenmark.dk – Hilti.dk – Icmsafety.com
MANUFACTURING	– There is no national production in Denmark.
EXOSKELETON BRANDS	– Comau – Hilti – Auxivo – Ergosante Technology – Bioservo – Ekso Bionics – Spindeband – Hunic Gmbh – Otto Bock
CURRENT CASES OF CUSTOMERS	– Vestas, – Danfoss, – Aalborg Airport, – Copenhagen Airport, – Bredballe church yard, – ”The local craftsmen”
NATIONAL STAKEHOLDERS	– Work Environment Denmark, – The Confederation of Danish Industry, – The National Research centre for Work Environment, – Aalborg University, – Innovation Foundation Denmark
ONLINE RESSOURCES	– Exoskeletter.dk – Exoskeletonreport.com – Orthexo.de

Figure 1: Overview of valuestream for Exoskeletons in Denmark

Manufacturing

At present, there is no production of exoskeletons in Denmark. All sold exoskeletons are imported from abroad by other manufacturers.

Sales organizations

There are currently four different sales organizations of exoskeletons in Denmark.

www.exoskeletter.dk

Exoskeletter.dk is responsible for the sales of the following brands: Bioservo, Auxivo, ErgoSanté, Ekso Bionics, Spineband, and HUNIC. They aim to sell a wide range of brands to best meet all needs. According to Arne Urskov (owner of exoskeletter.dk), they account for about 80% of the total sales of exoskeletons in Denmark. Arne said that about 200 exoskeletons were sold in Denmark in 2022, of which about 170 were sold by Arne. He mentioned that his biggest customer is "the local carpenter" who needs one or two exoskeletons for daily tasks. He also mentioned customers like Vestas and Danfoss.

www.immodenmark.dk

IMMO is a Danish company that sells exoskeletons from the brand Otto Bock and a few exoskeletons from the brand Hilti. They buy exoskeletons for special tasks and sell them on. According to their website, they have sold exoskeletons to the following customers: Billund Airport, Copenhagen Airport, Bredballe Cemetery.

www.hilti.dk

Hilti is a larger organization from Liechtenstein. They operate in Denmark and sell a wide range of tools and machines for the construction industry. They sell their own brand of exoskeletons. No specific customers mentioned here, but they target the construction industry.

www.icmsafety.com

ICMsafety describes itself as Denmark's largest independent supplier of occupational health and safety equipment. It is a Danish importer of robots. ICMsafety sells exoskeletons from the brand Comau.

National Stakeholders

Innovation Foundation Denmark

The Innovation Foundation Denmark has previously shown some interest in exoskeletons, but collaboration has been rejected in recent times with the reason: "exoskeletons already exist as a product, so it is a company that should be responsible for it."

Aalborg University

Aalborg University leads much of the research on exoskeletons in Denmark.

The Federation of Danish Industry

The Federation of Danish Industry does not have much knowledge about exoskeletons at present, with only one or two individuals within the organization having some knowledge. Since exoskeletons are still considered an "emerging market," it will take some time before this changes.

The National Research Centre for Work Environment

The National Research Center for Work Environment has been mentioned in connection with exoskeletons for use in rehabilitation. At NFC, there are physiologists who are examining exoskeletons more closely.

The Danish Working Environment Authority

Has a guideline for exoskeletons but mentions that there is not much research on potential side effects/benefits. https://at.dk/arbejdsmiljoeproblemer/ergonomi/exoskeletter/

Online Resources

There is a very limited number of Danish resources/literature focusing on exoskeletons other than the sales websites mentioned above. For more insight, one has to look beyond Danish borders, and the following websites are the most well-known.

www.exoskeletonreport.com

One of the most recognized websites for information on exoskeletons. However, Arne Urskov (owner of exoskeletter.dk) said that the information could be a bit outdated at times.

www.orthexo.de

A German-owned website that contains information about exoskeletons, although it is biased towards the German brand Otto Bock.