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## Japan – Lead Market for Age-Based Innovations?

German Institute for Japanese Studies (DIJ)  
Tokyo, Japan  
26 September 2013  
Prof. Dr. Cornelius Herstatt



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Questions for today's presentation

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1. How can companies turn the "Aging threat" into an opportunity to innovate?
2. Is Japan a lead market for age-based innovations? Why – why not?
3. How can Japanese companies benefit from this? Examples? Learnings?

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- **Population Aging and Innovations**
- The Role of Lead Markets
- Case Studies
- Observations and Conclusions



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**The neglected challenge – the aging society**



- Demographic change is a **global phenomenon**
  - Populations in many countries aging – Japan at the forefront
  - In parallel many populations shrink (vs. population growth)
- Demographic change is an **economic challenge**, but may be seen as an **opportunity** (Drucker, 2002; Kohlbacher & Herstatt, 2011; Magnus, 2009)
  - Shift in customer needs and expectations will lead to new products and services: Silver Business and Silver Products
  - New products, services will lead to growth and new business models, firms and new competition
- Aging can turn out to be a major **source of innovation** (Drucker, 1985)



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### What needs – and products – come along with age? Some examples

**Easy-to-use (household)**

**Luxury**

**Life-long learning**

**Food**

**Cars**

**Housing/ Sanitary equipment**

**Care-Robots, Rehabilitation**

**Drugs**

**Computers, Software, Peripherels**

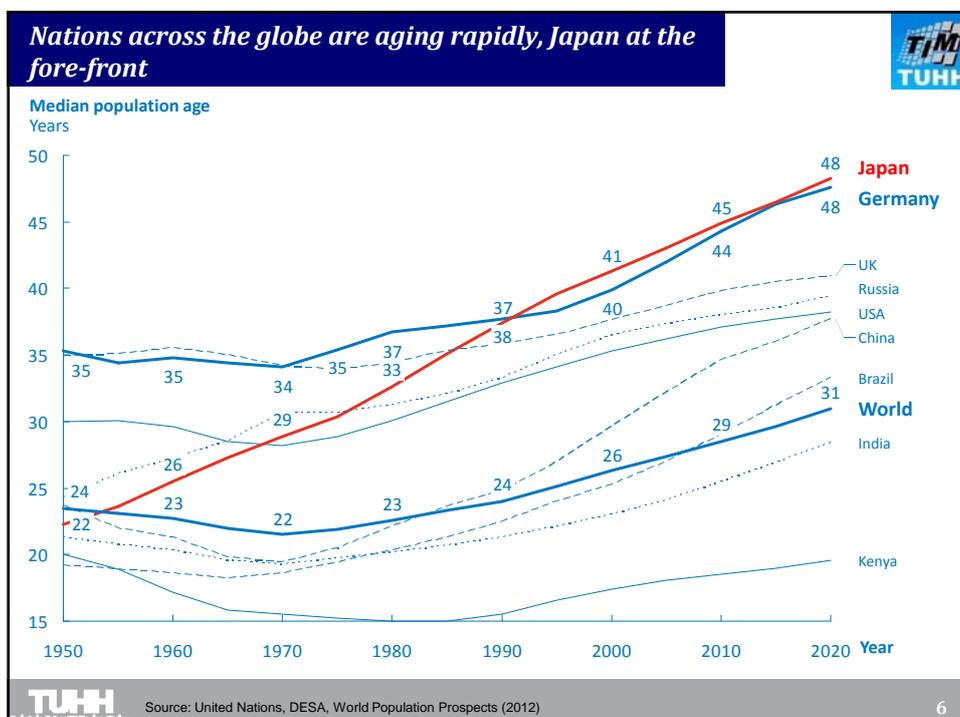
**Travel, Insurance, Financials**

**Visual support**

**Hearing Devices**

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**Lead market is the market of the first, broad application of a new design. Such designs supersede competing designs in lag markets and become widely dominant.**

Typical lead market diffusion pattern

Market penetration Percent

100

0

Time

- **Example:** Telefax-Technology in the 1980ies; Japan was the lead market, although the technology had been originally developed in Germany
- For innovations, **success in the lead market is often followed by international success** in so-called lag markets
- **Lead market designs** can displace other, alternative designs
- Thus, knowing your lead market is important for innovating companies!

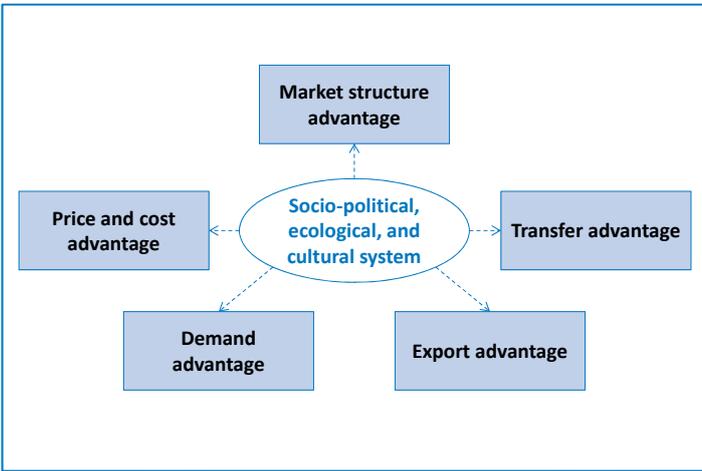
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SOURCE: Beise 2001

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### What determines a Lead Market?





```

graph TD
    A([Socio-political, ecological, and cultural system])
    B[Market structure advantage]
    C[Price and cost advantage]
    D[Transfer advantage]
    E[Demand advantage]
    F[Export advantage]
    A -.-> B
    A -.-> C
    A -.-> D
    A -.-> E
    A -.-> F
    
```

- Concept pioneered by **Marian Beise**, currently at Ritsumeikan Asia Pacific University
- Lead market** have been proven relevant for a number of important products and industries (ICT, Automotive, etc).
- Factors focus on **demand conditions**
- Factors depend on **socio-political, ecological, and cultural system** of a country



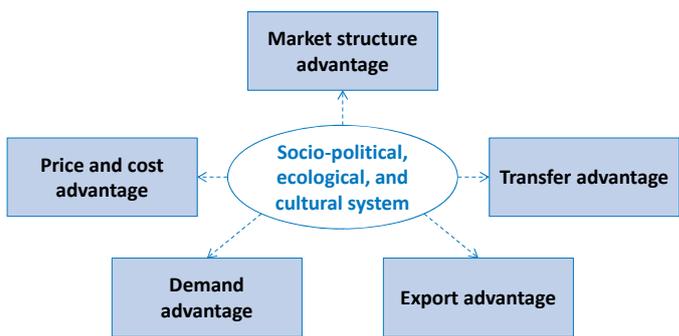
SOURCE: Beise 2001

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### Question: Does have Japan the potential to become a lead market for age-based products?



- How „promising“ are the various factors in the Case of Japan with regard to age-based innovations?

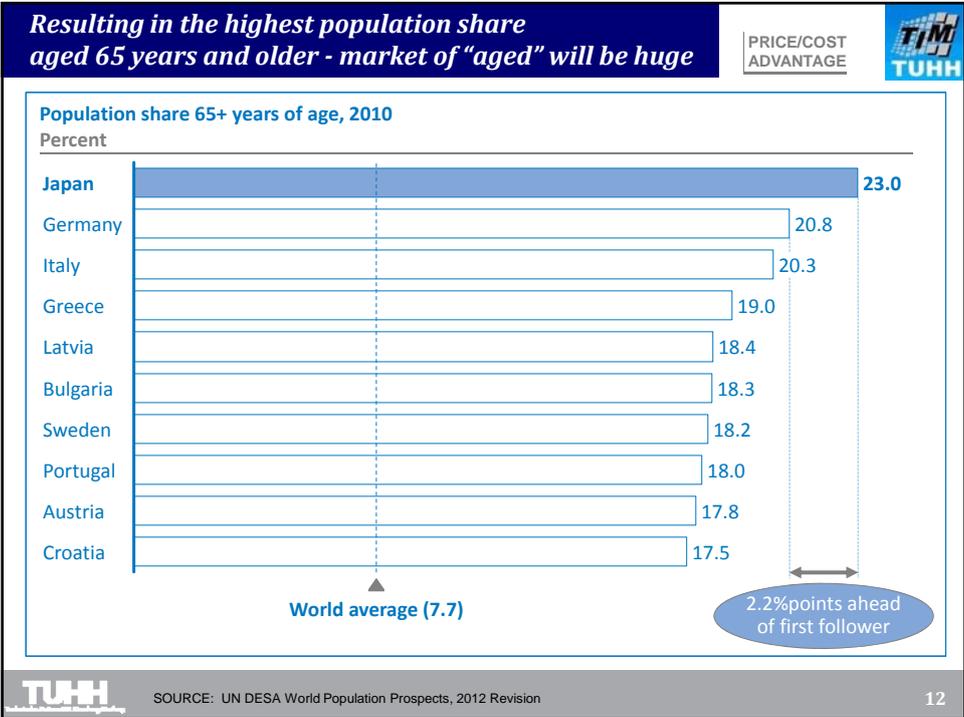
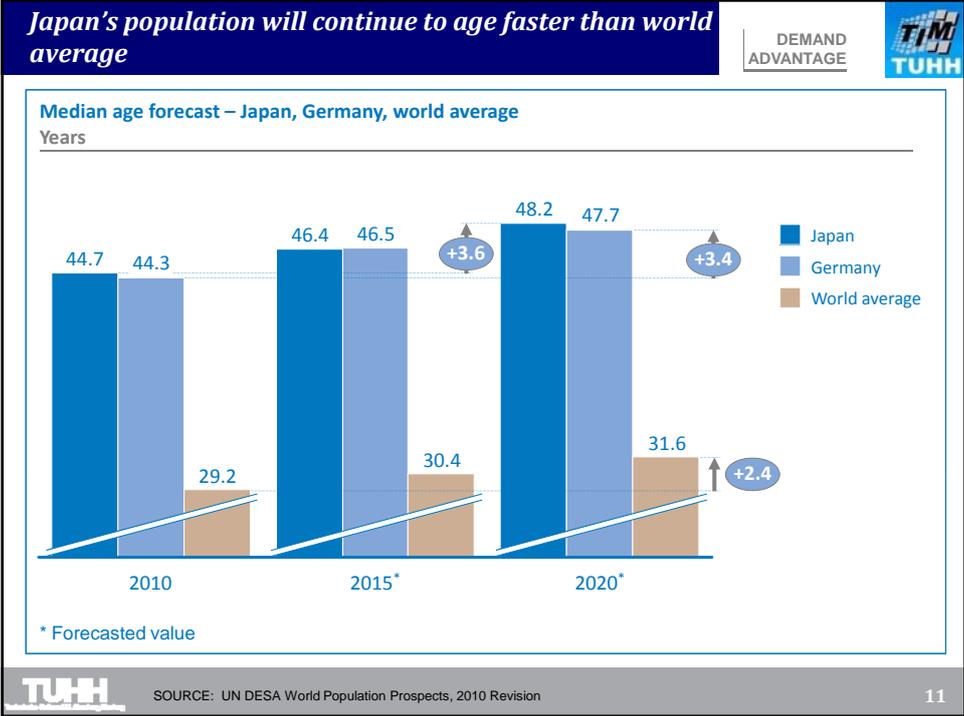


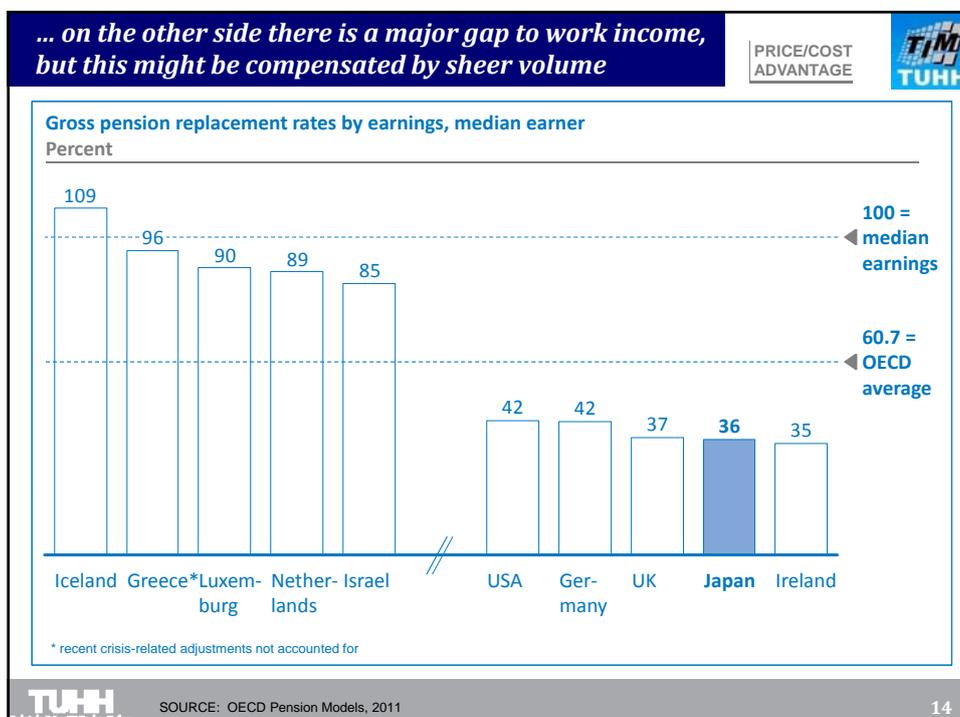
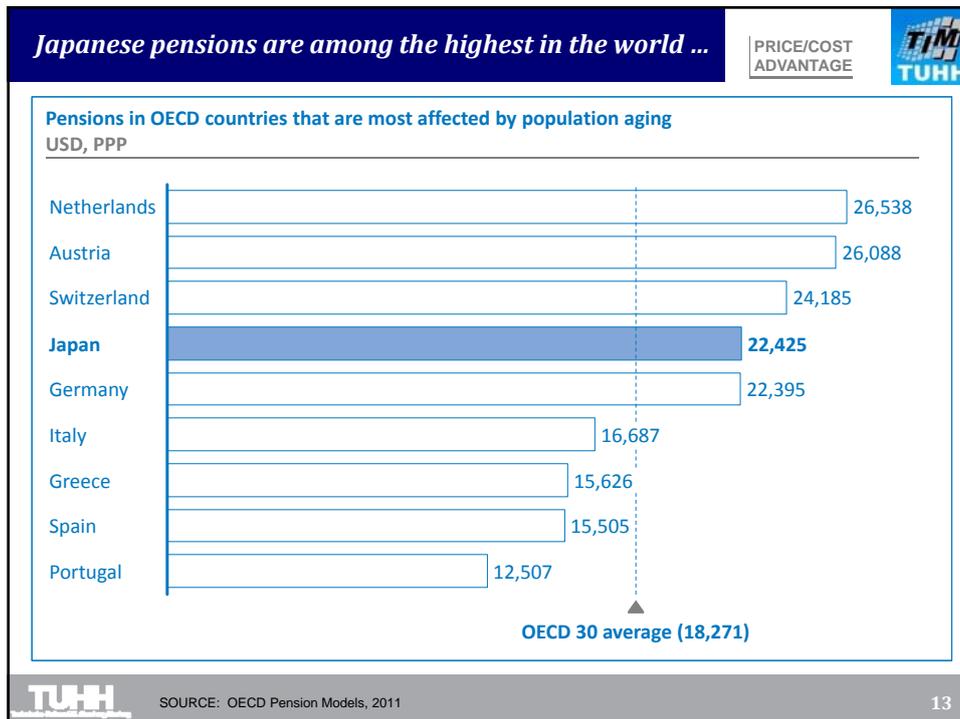
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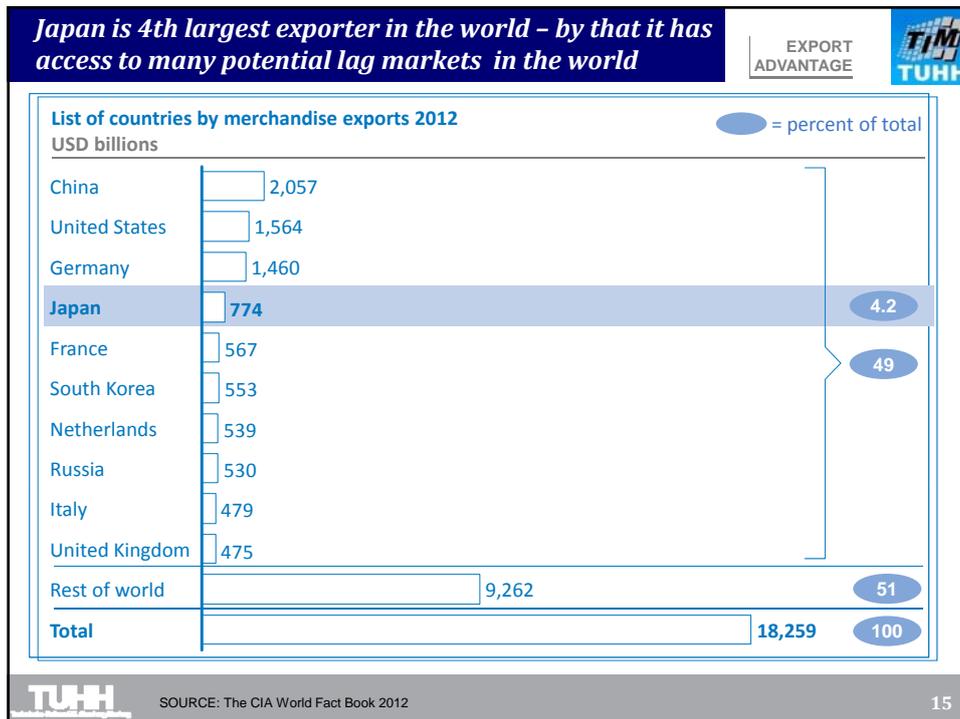
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    A -.-> D
    A -.-> E
    A -.-> F
    
```



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**Looking at all factors Japan seems a very promising candidate as lead market for age-based innovations**

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● = specific Japanese strength

Lead market factors	Examples
Price and cost advantage	<ul style="list-style-type: none"> <li>Large market size</li> <li>Fast market growth</li> </ul>
Demand advantage	<ul style="list-style-type: none"> <li>High income</li> <li>Early exposure to needs that other countries will experience later</li> </ul>
Transfer advantage	<ul style="list-style-type: none"> <li>Close international ties</li> <li>Sophisticated and critical customers</li> </ul>
Export advantage	<ul style="list-style-type: none"> <li>Sensitivity to international problems and needs</li> <li>Strong export orientation</li> </ul>
Market structure advantage	<ul style="list-style-type: none"> <li>Strong competition within industries</li> <li>High founding intensity (Start-ups)</li> </ul>

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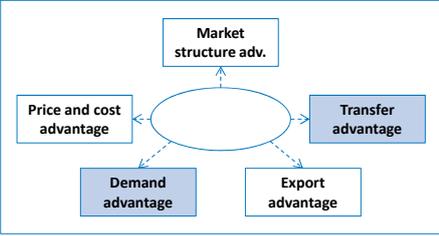
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## Mental Commitment: Paro Robot Seal





- Paro robot seal interacts with users, reduces stress, stimulates interaction between users and caregivers, and increases relaxation (source: AIST)
- Developed over 12 years by the National Institute of Advanced Industrial Science and Technology (AIST) of Japan, commercialized in 2005
- USD 15 million development cost financed through public funding
- Lead market factors Japan:
  - **Demand advantage:** early exposure of Japanese market to effects of demographic change and population aging
  - **Transfer advantage:** Japan known for innovation in robotics
- Major purchase by Danish care institutions marked market entry in Europe




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## Paro Robot Seal – Timeline

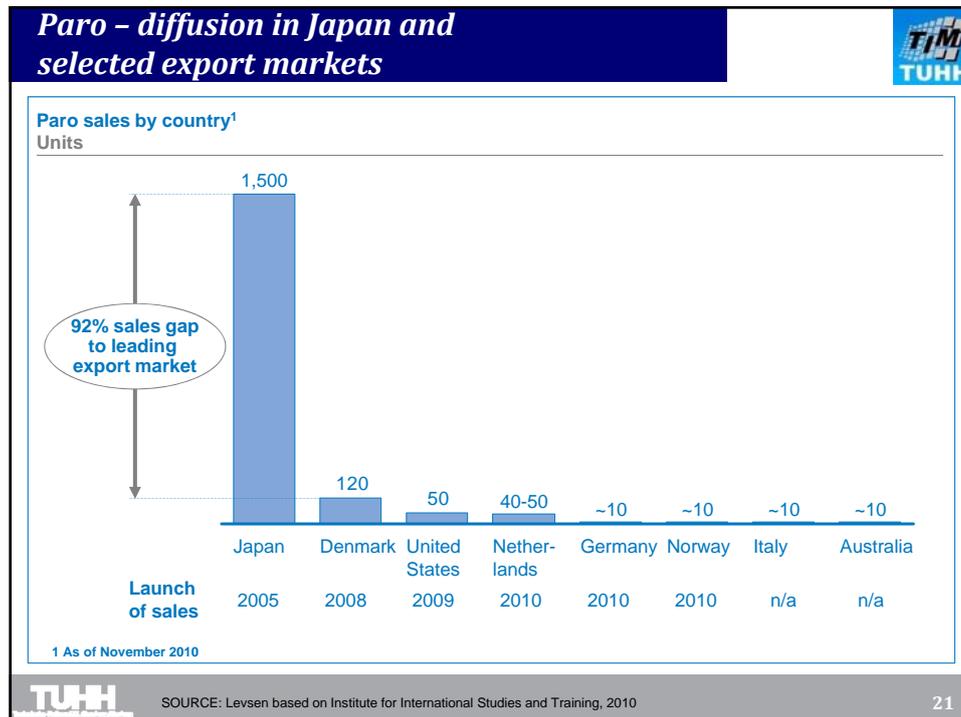


- 2005: Paro interactive therapeutic seal robot released for sale in Japan
- 2008: Paro sales launched in Denmark. In the same year, the Danish Technological Institute launches a national effort together with care centers and local councils to
  - Assess the effects of Paro
  - Professionalize the use of robots in welfare contexts
  - Train personnel for their use
- 2009: Paro certified as medical device by US Food and Drug Administration and sales in the US launched
- 2010: By November about 1,800 Paro units sold around the world, over 20% of which to medical and welfare institutions. Paro sales launched in
  - Germany
  - the Netherlands
  - Norway





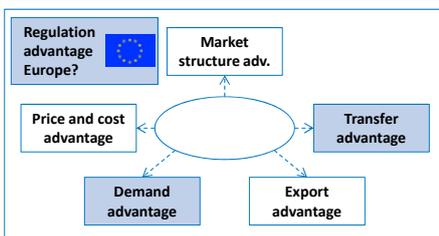
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## Mobility/Rehab: Cyberdyne HAL Suit



- Cyberdyne hybrid assistive limb (HAL) suit supports impaired users in standing and walking
- Developed in Japan under leadership of Prof. Sankai of Tsukuba University, marketed through private company Cyberdyne Inc. since 2009
- Lead market factors Japan:
  - **Demand advantage:** sophistication and experience of robot customers in Japan
  - **Transfer advantage:** Japan known for innovation in robotics
- Close cooperation with German partners has resulted in completion of safety certification in Europe – **lead market advantage Europe due to more rapid certification?**



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## HAL Suit – Timeline



- 1989: Prof. Sankai of Tsukuba University, Japan initiated HAL development
- 1990-1993: Mapping of neurons for leg movement
- 1997: first HAL prototype completed
- Early 2000s: several prototypes completed
- 2008: HAL rented out to a number of hospitals
- By October 2012: over 300 HALs used in hospitals and nursing homes across Japan
- February 2013: global safety certificate issued
- August 2013: Certified with “European Conformity” (EC) as world’s first robotic device for medical treatment



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### HAL Suit – International co-operation for accelerated market roll-out

- Close co-operation of Cyberdyne with German hospital Bergmannsheil in city of Bochum and other German stakeholders
  - 2010: Setup of Cyberdyne Germany
  - 2012: 3 HALs delivered to Bergmannsheil and redesign of old hospital building to HAL patient treatment facility
- Certification as medical device in accordance with European Medical Device Directive (MDD) in August 2013 (CE mark)
- Setup of Cyberdyne Care Robotics in Germany in August 2013
  - Manage Bochum patient facility
  - Roll-out HAL suit in German-speaking market (Germany, Austria, Switzerland)



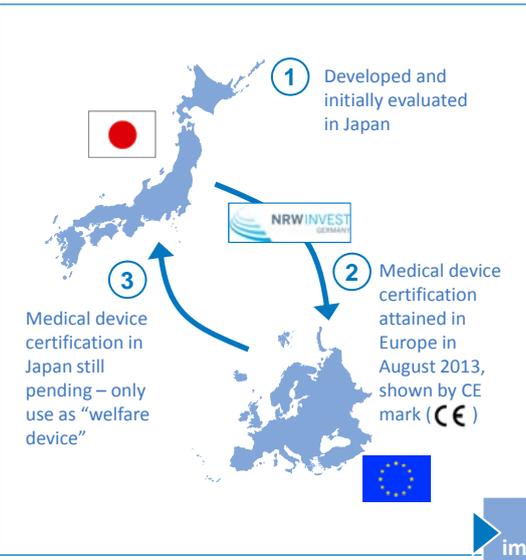

Die Zukunft fängt in Bochum an

CE certification in accordance with MDD allows large-scale market roll-out of HAL

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### HAL Suit – Europe at regulation advantage?



- Certification as medical device is major hurdle for bringing HAL suit to markets around the world – first trials conducted under provisional safety permit
- Medical device certification in most countries decisive for insurance coverage
- Certification process in Japan extremely difficult – certification process in Europe faster
- Countries that complete certification first have important adoption advantage and have higher chances to become lead market

Is Japanese regulation too strict to implement assistive robot innovations?

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## Telecom: Raku-Raku Phone





Market structure adv.

Price and cost advantage

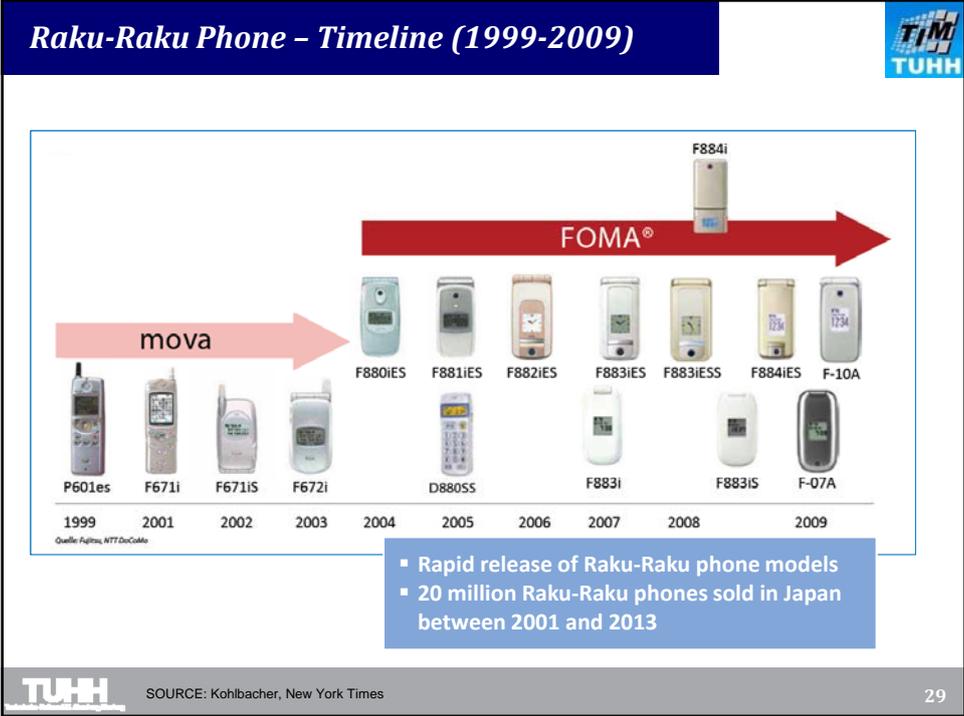
Transfer advantage

Demand advantage

Export advantage

- Simplified mobile phone based on the principle of universal design – “a phone that can be used by anybody”
- Raku means “easy-to-use”
- Two innovation efforts:
  - First model by Panasonic upon request of NTT DoCoMo (1999)
  - From model II on development and production by Fujitsu (2001)
- Development of Raku-Raku phone driven by collaboration with NTT DoCoMo
- Lead market advantage Japan:
  - Demand advantage: NTT DoCoMo as major and sophisticated customer
  - Price and cost advantage: scale of Japanese market regarding mobile phones for elderly


SOURCE: Kohlbacher
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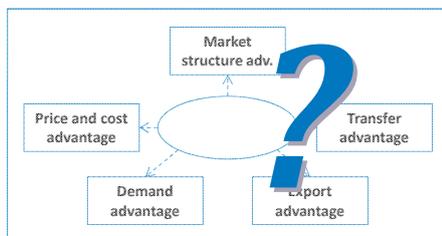


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## Eating Aid: My Spoon



- Eating aid robot to address
  - Chewing and swallowing problems,
  - Motor control problems,
  - Sitting posture problems,
  - Vision and cognitive issues
- Developed over 10 years by Secom Co. of Japan, funded by the Association of Technical Aids
- Currently available in Japan (Secom) and Europe (FOCAL Meditech)
- Lead market factors unclear at this time – very Japan-specific innovation design
  - Compatibility requirement with Japanese-style steep edge of plate
  - Different power unit required for European model (both voltage and power use)

## My Spoon – Timeline



- 1992: first discussed at 7th RESJA Annual Conference – “Meal assistance robot as a device for people with quadriplegia” (S. Ishii, F. Hiramatsu, S. Tanaka and Y. Amari)
- Continuous technical improvement
- 2003: most recent listed scientific publications
  - “Case study of the meal assistance robot”
  - “Clinical application of the meal assistance robot”
  - “The Development of Meal-Assistance Robot 'My Spoon'”
- Product adoption remains a challenge:
 

“(…) sales of a Secom product, My Spoon, a robot with a swiveling, spoon-fitted arm that helps older or disabled people eat, have similarly stalled as caregivers balk at its \$4,000 price.

– The New York Times,  
12 July 2009

### My Spoon™





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**Conclusion**



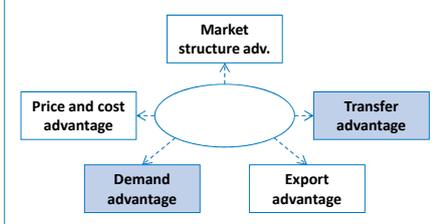
- There is a **need and a growing market for age-based innovations** – universal design does not address all age-associated challenges and there is **plenty of room for age-dedicated products/services**
- **Lead markets and lag markets do exist** – some countries adopt age-based innovations more readily than others
- **Japan offers good conditions** to become a lead market in age-based innovations (many still un-tapped fields)
- However, in order to capture this potential, Japanese age-based innovations need to **also** consider needs, preferences, and other external conditions in foreign markets – **making products and services more “exportable”**
- With regard to products that need to go through **extensive approval and accreditation** Japan should collaborate internationally in order to get products into the market and build up a certain level of pressure on the domestic approval agencies (WTO-approvals, ECE)




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**Japan has missed a number of attractive product opportunities: Example Indoor Mobility: Stair Lifts**



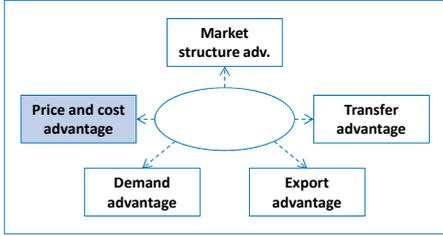


- Originally developed in 1923 by C.C. Crispin in the USA for a sick friend who could not use stairs
- Between 1923 and 1962 only available in the US market
- Lead market factors USA:
  - **Demand advantage:** stair lift industry in early years almost exclusively serving wealthy homeowners
  - **Transfer advantage:** stair lift internationally popularized with American Hollywood movies between the 1940s and 1960s
- Spread of 1962 “Inclinette” design to international markets (lead market design)
- International transfer of innovation via traveling businessman, grandson of largest Dutch elevator maker



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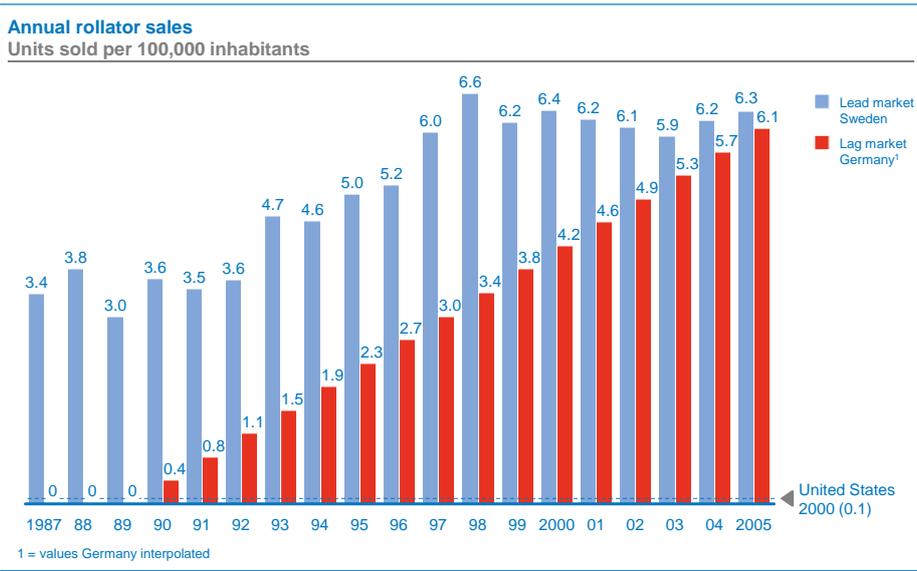
### Japan has missed a number of attractive product opportunities: Example Rollator Walkers

- Developed in 1978 by polio sufferer Aina Wifalk in Sweden for her own use
- Quickly adopted in Sweden, but more than a decade of delay before adoption in other European countries
- Lead market factors Sweden:
  - Price and cost advantage: quick creation of economies of scale due to (1) large purchasing volume and (2) centralized purchasing process of Swedish social security systems
- Continued leadership in rollator design in Central Scandinavia (Sweden, Norway)
- Rapid spread to other European markets – especially Germany – since early 1990s
- Today still substantial country-specific differences in market penetration

### Rollators – diffusion in lead market and selected lag market

Annual rollator sales  
Units sold per 100,000 inhabitants



Year	Lead market Sweden	Lag market Germany <sup>1</sup>
1987	3.4	0.0
1988	3.8	0.0
1989	3.0	0.0
1990	3.6	0.4
1991	3.5	0.8
1992	3.6	1.1
1993	4.7	1.5
1994	4.6	1.9
1995	5.0	2.3
1996	5.2	2.7
1997	6.0	3.0
1998	6.6	3.4
1999	6.2	3.8
2000	6.4	4.2
2001	6.2	4.6
2002	6.1	4.9
2003	5.9	5.3
2004	6.2	5.7
2005	6.3	6.1

United States 2000 (0.1)  
1 = values Germany interpolated

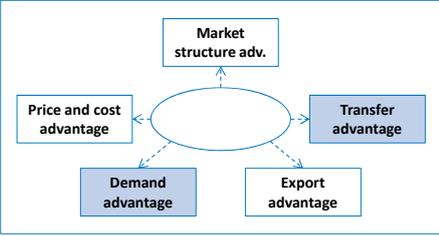
SOURCE: Levsen based on multiple sources: Source values for (1987-2001 sub AB Sjukvårdshuvudmännens Upphandlingsbolag 2001), 2002, 2003, 2004 (Estreen 2005), 2005 (Alván 2010), Stiftung Warentest 2005, Maddison 2010, US value: Lott 2000

### Japan has missed a number of attractive product opportunities. Example: Reverse Mortgages:





- "A reverse mortgage enables older homeowners (62+) to borrow against the equity in their homes without having to sell the home, give up title, or take on a new monthly mortgage payment" (NRLMA)
- First developed and adopted in the United Kingdom
- Lead market factors UK:
  - **Demand advantage:** customers with advanced knowledge or financial and mortgage products
  - **Transfer advantage:** UK known for innovation in financial services
- USA – although originally lag market – have played exceptional role in RMs, e.g. through early regulation that facilitated market growth (regulatory advantage)

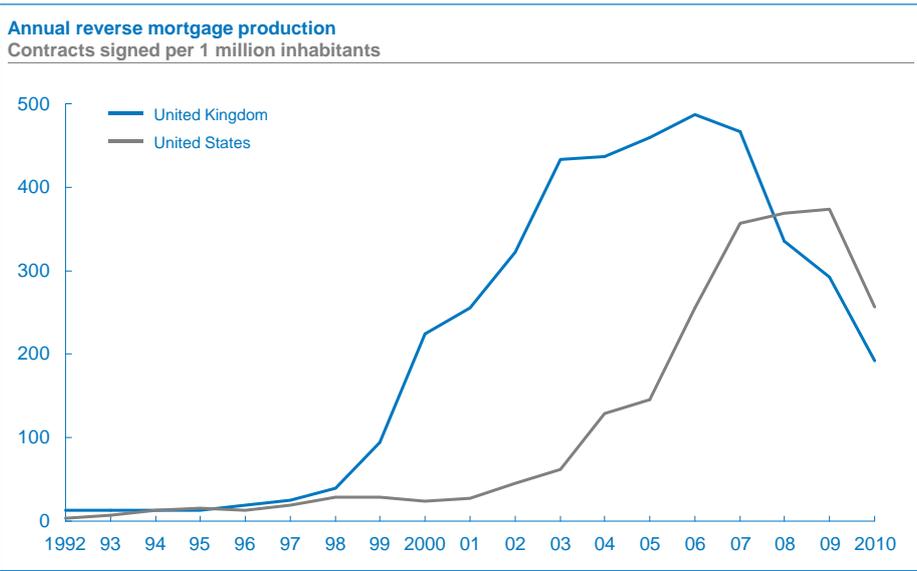



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### Reverse mortgages – diffusion in lead market and selected lag market



**Annual reverse mortgage production**  
Contracts signed per 1 million inhabitants



Year	United Kingdom (Contracts per 1M)	United States (Contracts per 1M)
1992	10	5
1993	15	10
1994	20	15
1995	25	20
1996	30	25
1997	40	30
1998	60	35
1999	100	40
2000	220	45
2001	250	50
2002	320	60
2003	430	70
2004	440	130
2005	460	150
2006	480	250
2007	460	360
2008	340	370
2009	300	370
2010	200	260



SOURCE: Levens based on SHIP Equity Release 2011, NRLMA 2012, Maddison 2010

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**"Cultural distance" as a major hurdle to benefit from lead market advantages? Not sufficient to explain!**

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**Country comparison of cultural parameters: Japan, Germany, United States**  
non-dimensional

Parameter	Japan	Germany	United States
PDI	54	35	40
IDV	46	67	91
MAS	95	66	62
UAI	92	65	46
LTO	80	31	29

Hofstede 5D model of national culture:

- Power Distance (PDI)
- Individualism versus Collectivism (IDV)
- Masculinity versus Femininity (MAS)
- Uncertainty Avoidance (UAI)

- Japan culturally strongly divergent from other advanced economies
- Japanese innovations may be perceived in a different cultural context abroad
- Role of elderly in a society closely linked to domestic cultural values
- International diffusion of Japanese innovations with strong link to Japanese culture may be difficult

TUHH SOURCE: Hofstede Center: National Cultural Dimensions 41

**Management implications for globally successful innovations (1/2)**

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Price/cost advantage	<ul style="list-style-type: none"> <li>• How robust is the <b>value proposition</b> of our innovation in countries with different cost structures (e.g. different level of labor costs for elderly care)?</li> <li>• Is our innovation <b>viable in smaller markets</b> than Japan with lower economies of scale?</li> </ul>
Demand advantage	<ul style="list-style-type: none"> <li>• Does our innovation <b>changes in the environment</b> (trends) that will not only affect Japan but also other countries?</li> <li>• <b>At what time</b> will these trends affect other countries?</li> <li>• Are there <b>already potentially competing local solutions</b> in other countries?</li> </ul>
Transfer advantage	<ul style="list-style-type: none"> <li>• Is Japan perceived as the <b>global leader</b> in an innovation category?</li> <li>• Are Japanese <b>innovation designs perceived as very Japan-specific</b> or do they incorporate needs and preferences from other countries? Specific market research is needed!</li> </ul>

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## Management considerations for globally successful innovations (2/2)



Export advantage

Market structure advantage

- Is there strong **export orientation** of our company?
- **How well do we know our export markets?** Do we understand the end customers' needs there?
- Do we have an **organizational setup** facilitating to implement innovations abroad? Do we have resources in leading country markets for our innovation like local application engineering?
- Are our age-based innovations well-positioned within our company structure? Would a **spin-off, FDI in target markets**, or an **innovation strategy based on M&A** have advantages?
- Are we sure that we are **tracking competitors in the most innovative and dynamic markets?**

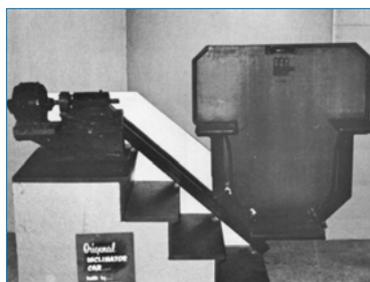
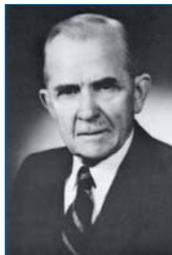


# BACKUP

## Stair Lifts – Timeline



- 1923: developed and patented by C.C. Crispin, Pennsylvania, USA
- 1924: establishment of stair lift company "INCLINATOR Company of America", 1 stair lift sold
- 1925: 6 inclinators sold
- 1928: first model for winding stairs developed
- 1947: first US competitor enters market
- 1940s to 1960s: Oscar-winning and -nominated movies feature stair lifts, making the product internationally known
- 1960: owners' grandson of largest Dutch elevator maker "Jan Hamer en co" travels to the US and witnesses stair lifts
- 1962: first non-US stair lift available by Jan Hamer and Co – model directly based on US stair lift design
- 1960s/1970s: stair lifts introduced in all European markets, new companies founded



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  - Indoor Mobility: Stair Lifts
  - **Outdoor Mobility: Rollator Walkers**
  - Financial Services: Reverse Mortgages
- Observations and Conclusions



## Rollators – Timeline



- 1978: developed as a user innovation by Swedish polio sufferer Aina Wifalk
- 1988: Swedish rollator sales above 30,000 units
- 1990: first availability of rollators in largest European market Germany
- 1993: Swedish sales exceed 40,000 units
- 1996: first import of 1,600 units into the US
- 1998: Queen Ingrid of Denmark uses a loaned rollator for first time in public, becoming “a powerful image that encouraged others not to be ashamed of their rollators”
- 2000: US sales at 20,000-40,000 units
- 2000: three main Swedish makers produce 150-175,000 units annually, exporting >50%
- 2005: German insurance-covered rollator sales are at ~500,000 units per year
- 2012: approximately 2 million rollators in use in Germany, making it the biggest country market worldwide








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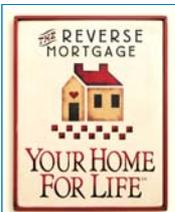

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## Reverse Mortgages – Timeline



- 1930: UK-based Home & Capital Trust Ltd. Develops “home equity reversions”, a precursor to reverse mortgages
- 1961: first RM in the United States by Nelson Haynes of Deering Savings & Loan: the mortgage recipient is Nellie Young, the widow of Mr. Haynes’s high school football coach
- 1965: Home Reversion offers the first reversion income scheme in the UK
- 1981:
  - Incorporation of non-profit National Center for Home Equity Conversion (NCHEC) in Madison, WI, US
  - Initial exposure of reverse mortgages through nationwide media in the US (Newsweek, Time, U.S. News, Good Morning America)
  - Musashino municipality near Tokyo launches first Japanese RM pilot
- Since 1984: several bills passed by U.S. Congress to promote RMs (e.g. mandating federal insurance, tax treatment of RMs, consumer protections)
- 2000: UK annual volume of signed RMs exceeds 10,000 contracts for the first time – two years before reaching 10,000 contracts in the US market
- 2006: market peak of RMs in the UK (~30,000 contracts), beginning of market contraction in UK market
- 2009: highest ever monthly volume of RMs in the US (April 2009: 11,660)





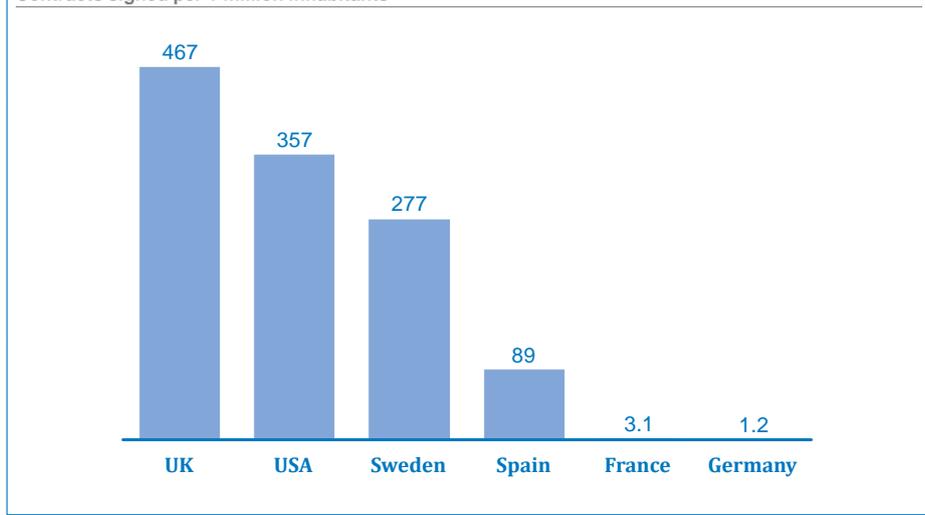

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## Reverse mortgages – diffusion in lead market and selected lag market



**Reverse mortgages signed in 2007**  
Contracts signed per 1 million inhabitants

(ESTIMATES (EXCEPT USA))



Country	Contracts signed per 1 million inhabitants
UK	467
USA	357
Sweden	277
Spain	89
France	3.1
Germany	1.2



SOURCE: Levens based on Fornero et al. 2011, NRMLA 2012, Maddison 2010

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**Designing products for everyone or specifically for old people?**

**VS.**

Universal design	Age-based innovations
<ul style="list-style-type: none"> <li>Designed to maximize usability by diverse users – irrespective of age</li> </ul>	<ul style="list-style-type: none"> <li>Designed primarily for use of aged users</li> </ul>
<p><b>Kitchen grips</b></p>  <p><b>Ring plug</b></p> 	<p><b>Stair lift</b></p>  <p><b>Rollator</b></p> 
<ul style="list-style-type: none"> <li>Higher market potential</li> <li>Potentially costly over-engineering of design features</li> <li>May not always be possible or economically advantageous</li> </ul>	<ul style="list-style-type: none"> <li>Incorporating age-specific needs and preferences</li> <li>May be necessary where universal design is not available</li> </ul>

**TUHH**

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