KNOW-WHY AND DESIGN: KEY DIFFERENCES BETWEEN CRAFT AND PROFESSION ILLUSTRATED AT ORTHOPAEDIC SHOEMAKING

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1. The craft of orthopaedic shoemaker

Serving people with constrained personal mobility

Causes:
- Skeleton muscular deformation (genetic-aging)
- Neuro-muscular problems caused by cerebral palsy or stroke
- Trauma e.g. (car-)accidents

Rehabilitation functions: Maintain and recover
- Protect (Diabetic, Leprosy)
- Correct stance (static)
- Correct/restore gait (dynamic)

From simple modification to bespoke complex solutions
Task complexity: Shoes as engineering constructions

- Interaction between lower limb (human) and shoe construction
- Maintain / recover / protect, stance, gait
- Statics / dynamics; (Bio-)mechanical and constrains (Complex)
- Psychological constrains

Development: From shoemaking healthy $\rightarrow$ unhealthy foot

- Empirical knowledge (personal experience)
  - Problem-solution catalogue
  - Form is bespoke, no explicit design
- Traditional and slow development of knowledge base
- Professional autonomy of the “master”
- Traditional knowledge transfer from master to apprentice
Recent developments in the craft

Growth of scientific knowledge
- Biomechanics lower limbs, gait analysis

Technical developments
- Imaging techniques
- Measuring techniques (stress, strain, shear, movement)
- Knowledge of materials-behaviour and manufacture techniques

Demand for evidence based practice and demand for scientific explication

Shift in focus from shoe design to device design for functional improvement

Pressure on professional autonomy → team solutions

Conclusion: Craft meets its limits
2. Questioning of professional knowledge

The challenge of the professional autonomy by the insurance companies:

• Significant non-use of devices (approx. 10-15%)
• Emerging of non-traditional competitors
• Questioning the professional knowledge base
• Demand for evidence based practice and demand for scientific explanatory knowledge: know why!

Conclusion: Required shift from craft to profession
3a. Consequences for the profession

From catalogue of solutions to explicit functional design, user perspective has to be met!

Know how is not enough, know why is requested

Scientific body of knowledge has to extend:
  Bio-mechanics / materials etc.

Explicit engineering design (function, form)

Design process 1: functional restore
  Parameters: cover, stance and gait

Design process 2: shoe design
  Parameters: form, stiffness, appearance
3b. Consequences for education

Change in focus and attitude:

• Know how and know why
• Double design process: function and form
• Teamwork with related disciplines
• Expanding knowledge base
  – Scientific knowledge → theory learning line
    • Bio mechanics etc
    • Materials behaviour
  – Practical motor skills → both artisanal and rational manufacture

..... To serve clients needs
4. An improved curriculum design

The case Vietnam:

- Planned for **50% theory** (theory modules) and **50% practice** (practical learning)
- Students development in consecutive steps: **Know, know how, shows how and demonstrates**
- A course duration of 2400 hrs
- Fit for accreditation by IVO as a Cat-II course
- Possibility for students specializing on situation in home country
Course in headlines
Developmental steps

Artisanal handicraft shoemaker → Craftsman

Orthopedic shoe technologist → Professional

Entrepreneurial orthopedic shoe technologist → Entrepreneurial Professional
Course structure

- **Shoe making knowledge & skills**
- **Orthopaedic Shoe making knowledge & skills**
- **Orthopaedic shoe making knowledge & skills and entrepreneur skills**
- **Independently Orthopaedic shoe making**

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- Start cohort
- First exam week
- Second exam week
- Third exam week, graduation
Objectives Block 1-2

At the end of block 1,2 the student a competent artisanal handicraft shoemaker who:

- can work safely in a workshop, using both conventional tools and operating modern machines
- knows about shoes, knows how to make then, demonstrates how to make them and actually produces shoes
- is able to communicate with colleagues on flaws in measure taking, shoe design and production based on: 1) the shoes the student produced/repai red him/herself and 2) the shoes another student has produced for him/her.

Has acquired theoretical knowledge of the healthy lower extremities and foot in the theory modules such as: Anatomy, (Bio-) Mechanics, Physiology en General Pathology.
At the end of block 3,4 the student is an *Orthopedic shoe technologist* who:

- is competent in understanding, designing and producing the most common and some specialized types of orthopedic shoes and artefacts
- can communicate with others about these artefacts
- is able to communicate with real clients

Has acquire theoretical knowledge of typical diseases (Diabetics, Leprosy, club Feet) resulting in mobility problems, in theory modules such as: Pathology, Gait analysis, Orthopaedic technology of the lower limbs, Wound care and Production and Materials
At the end of block 5, the student has individually profiled/specialized in the specific deceases/mobility issues in his country of origin

At the end of block 6, the student has accomplished:

• a final apprenticeship where he/she will communicate with, specify, design and produce orthopedic shoes for real clients to their convenience
• a final work in which the student demonstrates that these solutions are according professional standard and he will explicate the decision process

In the blocks 5-6 the student acquires additional theoretical (bio-medical) knowledge and entrepreneurial skills, so the student is able to setup a workshop after graduation.
Results sept 2014

• Course concept ready
• Start Pilot project June Block 1-2
• Results block 1

• Students satisfaction ok
• Block 3-4 and Block 5-6 under construction
• Partnership Fontys ↔ Vietcot developing
Conclusion

• The curriculum design facilitates the shift from craft to profession
• The educational program is up and running
  – Some tension on learning know why
• Preparations are carried out for the second student cohort
• Research is performed on the design process in shoe engineering
Thank you for your attention !