
# Use of CDIO Standards In Swedish National Evaluation of Engineering Educational Programs

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# Introduction

- The CDIO standards
  - define the characteristics of a CDIO program
  - provide a method for continuous development of a program towards the CDIO goals
- The standards have so far been applied to a relatively low number of programs who have also been active in the development of the standards
- There is a need to evaluate the use of the standards in wider contexts, including different engineering domains and for non-CDIO-associated programs and schools

- **The opportunity to do so arose when the CDIO standards where included as a part of the Swedish national evaluation of engineering programs**

# Outline

- Swedish national evaluation of engineering programs ("HSV")
- Use of CDIO standards in HSV evaluation
- Research goals and methodology
- Results
- Conclusions

# Swedish National Evaluation of Engineering Programs (HSV)

## Purposes

Audit educational programs wrt the requirements stated in the Swedish university law and regulations

Contribute to the universities' internal quality and development work

Inform stakeholders about the state of university education

*Students, government, public*

## Approach

Self-assessments on university and program levels

*Self-assessment report*

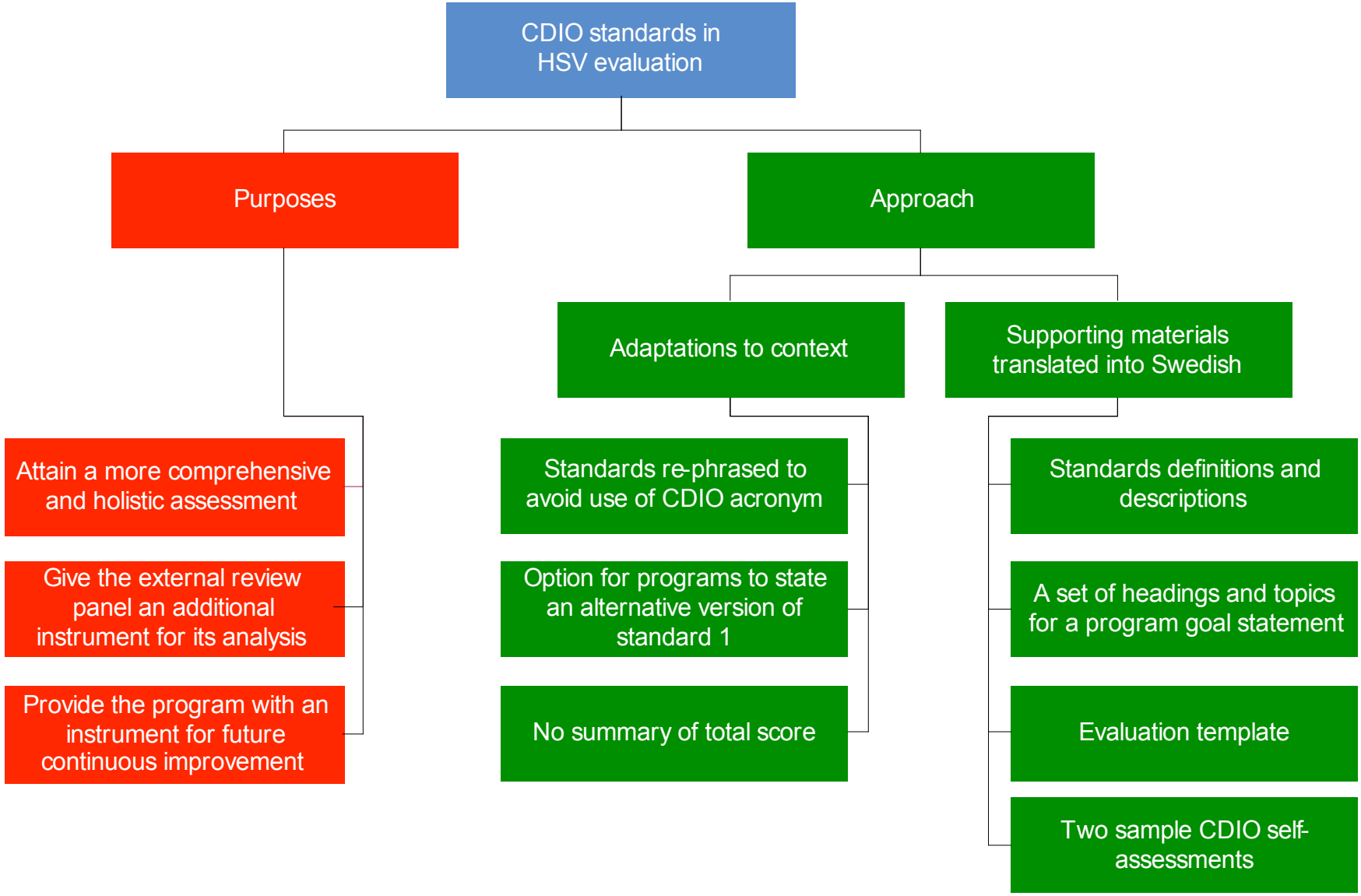
Review and site visits by external review panel

*Review report*

Follow-up

*Summarizing report from HSV Conference*
*Final follow-up 1-3 years later*

# CDIO standards in the HSV evaluation



# Evaluation of use of CDIO standards in the HSV evaluation

## Goals

Investigate the program managers' view of the

- Relevance
- Benefits
- Ease of use
- Limitations

of the CDIO standards

## Research method

- Survey sent to all program managers
  *About 100 programs*
  *30% response ratios*
- Interviews (5) with selected program managers
- Analysis of self-evaluations

# Survey questions

**Evaluation of the 12 CDIO standards in the HSV evaluation…**

**Background questions**

- *Type of program*
- *Previous knowledge of CDIO*
- *…*

**Overall statements**

**Statements per standard**

- *The description of the standard is easy to understand*
- *It is easy to evaluate my program with respect to this standard*
- *The meaning of the standard is relevant for my program*
- *Program development using this standard improves the quality of the program*

**The rating-scale**

**General comments**

- *Positive aspects*
- *Improvements*
- *Learning aspects*

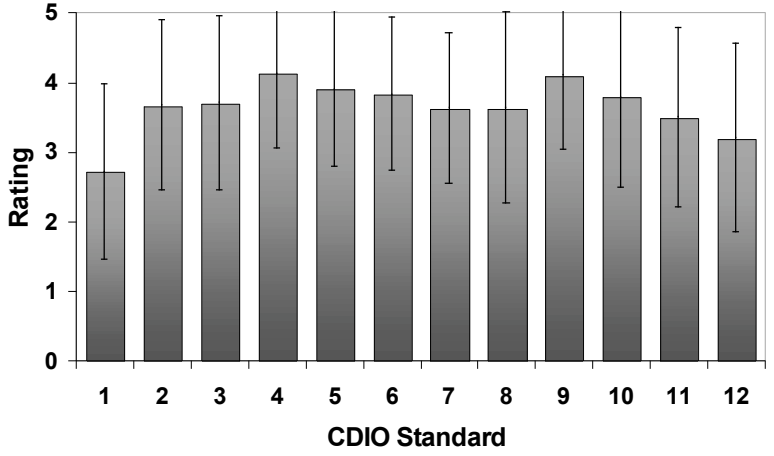
**Five-level scale where “1” corresponds to "Completely disagree", and “5” corresponds to "Fully agree"**

# Results

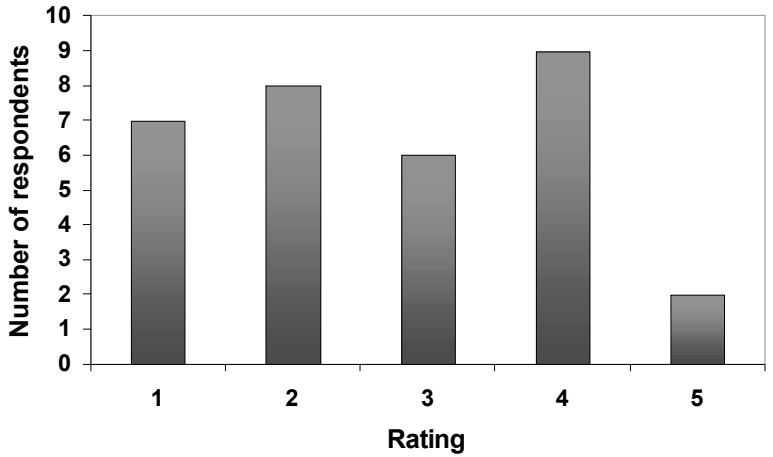
# Relevance, applicability and ease to understand

- The data from the survey shows that the CDIO standards indeed state a number of principles that are relevant for many programs (average 3.7)
- Standard 1 ”CDIO of product and systems as context” appears to have caused many discussions concerning interpretation and relevance
  - *“The major discussion was about the context. Is this the context, is it only this and nothing more?”*
- Some respondents had difficulties understanding the systems engineering terminology used

## Ease to understand



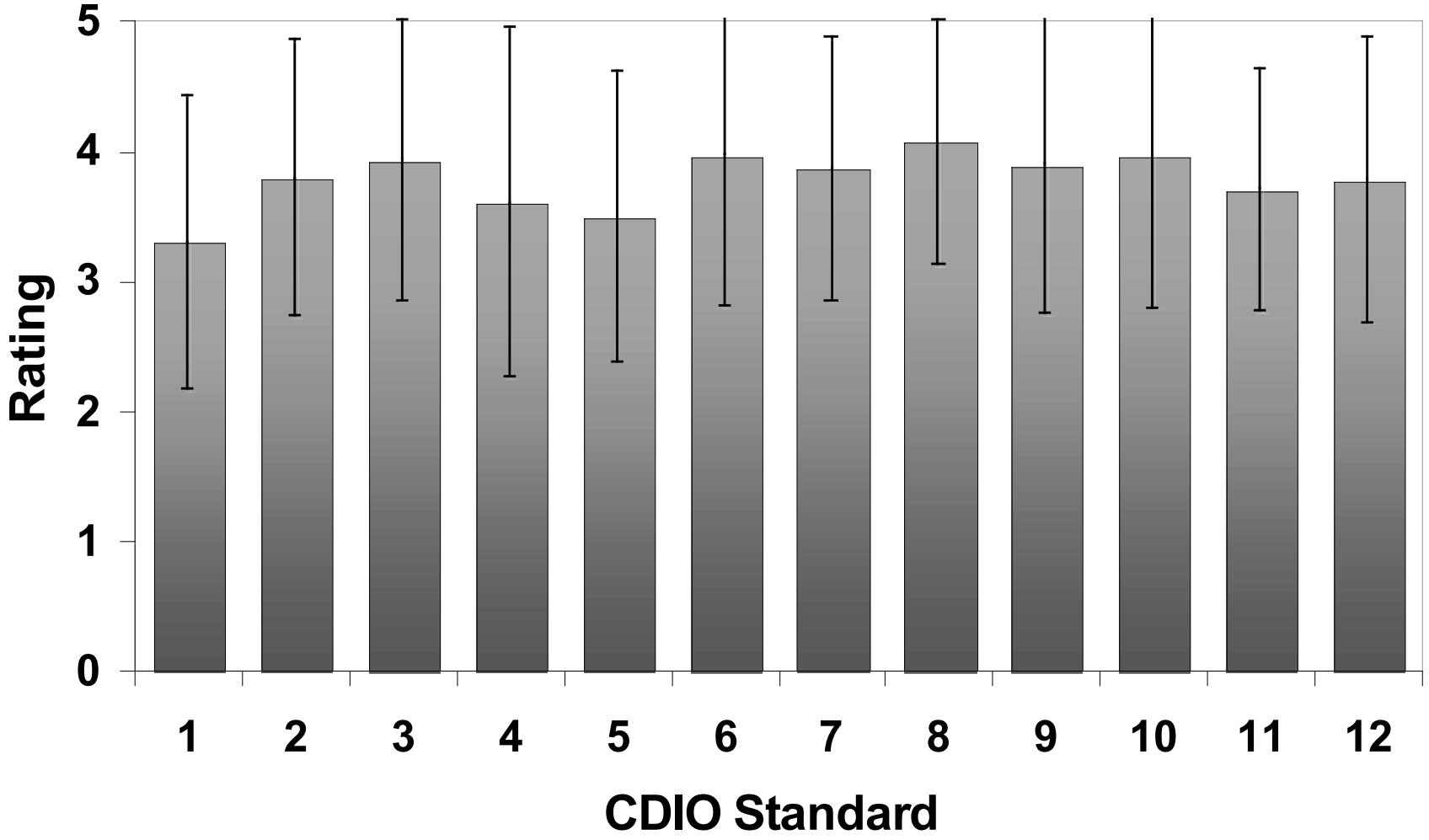

## Distribution of ease to understand



# Modified statements of Standard 1

| | |
|---|---|
| **Modified statements close to Standard 1** | *"The principle is to educate engineers to meet the needs of the construction industry, ie for planning, design, engineering, production, operations and maintenance".* |
| | *"The context is the didactical process: Analysis of educational needs, planning, implementation, assessment, evaluation and development."* |
| **Major re-definitions – science-oriented programs** | "*The X program is strongly research-oriented and the students learn how to think, analyze, and solve problem in a research context rather than in the technical production context. The emphasis is more on knowledge production than on "product" production*" |

# Will changes towards implementing the standard improve program quality?




**Average: 3.8**

# Benefits

| | |
|---|---|
| **Support for a systematic approach towards program development** | *"The most obvious advantage is that the standards are systematic and good! You get an explicit structure for the work; you can get a basis for decision and renewal..."* |
| **Guidelines for supporting program development decisions** | *"There is always discussion when you want to develop and change things. If we can agree that it is desirable for the program to address this, you can conclude that this must then be changed or removed; we must do it this way"* |
| **Agenda for implementing and following up a change process** | *"It was also a help to actually analyse what measures to take, an action plan where the measures are related to what we want to achieve, related to these standards and our assessment of fulfilment"* |
| **Promotion of integrated learning** | *"What really made me enthusiastic about CDIO is that it provides a strategy for integrating non-technical skills in the curriculum – this is very challenging"* |

# The rating scale

- The number of levels (5) was seen as appropriate
- The two-component rating scale made it difficult to choose the ”right” value (average 2.5)
  - Many strategies for coping with this difficulty deviated from the intent of the scale
- The premium given to planning prior to implementation made some respondents feel that the got a lower rating than they deserved
  - *“There was great importance attached to writing things down. In the long run that is reasonable. But you can have a system although it is not documented, and you can have routines, even though they are unwritten.”*

# Perceived limitations

- Weak considerations of disciplinary knowledge & connection to research due to the perceived focus on personal and interpersonal skills

- Many respondents emphasize the need to view the evaluation exercise as a support for quality enhancement processes, rather than quality assurance.
  - *The scale is not considered useful for rating a program in absolute terms, nor to compare ratings*

- The outcomes of the evaluation vs some Standards is heavily dependent on the organization and structure of the university, notably 9 and 10.

# Conclusions 1 (2)

- In the Swedish national evaluation of engineering degree programs a modified version of the CDIO standards has been used to evaluate about 100 engineering programs.

- Survey and interview results indicate that the standards
  - Are relevant and applicable for a wider range of programs than have earlier used the standards
  - Most important benefit is that the standards provide a basis for systematic program development
  - Would improve program quality if implemented

# Conclusions 2 (2)

- Challenging issues
  - interpreting Standard One in the context of the science and technological domain in question and
  - the proper use of the rating scale

- The CDIO standards need to be complemented with other instruments in an overall program evaluation, and **the role of the standards in the context must be clear**
  - concerns that the evaluation does not do justice to its attention to disciplinary skills and connections to research.


# Questions?