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Development of instruments for assessing the Industry 4.0 Maturity Level

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Curriculum Development
of Master's Degree Program in
Industrial Engineering for Thailand Sustainable Smart Industry

Agenda

- **Week 1** - study and understanding of the structural dimensions (Acatech), distribution of the dimensions among the teams: (1) Resources, (2) Information Systems, (3) Organizational Structure and (4) Culture
- **Week 2 and 3** - Preparation of the questions and structuring of the evaluation instrument
- **Week 3** - Validation of the instrument
- **Week 4** - Presentation

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Instrument Construction Procedure

1. Describe the population for which the instrument is intended;
2. Describe the scope and objectives of the instrument to be built.
3. Define constructs and aspects that integrate it;
4. Validation of the instrument;
5. Application.

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Constructs

- The items form the constructs and the constructs form the instrument.
- Identify the theoretical milestones and then translate them into observable and measurable variables so that they objectively delimit the concepts they represent. Example:
  - Business Excellence (construct) - develop a conceptual description of this expression and from this theoretical basis extract variables that allow measuring it.
  - Business Excellence = market leadership (weight 10), growth (weight 25), profitability (weight 30), liquidity (weight 15), indebtedness (weight 10).

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Formulation of the Items

- Simplicity of formulation. Ensuring matching one item - one task, and one task - one idea.
- Break down items by valuation dimensions.
- Respect the face validity criterion. The item should not appear as ridiculous, unreasonable or childish.
- The formulation should be objective. Use a likert scale with 5 posts.

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Validation exercise

- Spoken reflection and pre-test application. Points of interest:
  - Identification of ambiguities.
  - Identification of processes and strategies used by subjects in their responses.
  - Assessment of the effectiveness and quality of the various response alternatives formulated.
  - Identification of peculiar aspects or added difficulties.
  - Knowledge of the general attitudes of the subjects towards the proposed items and this throughout the test.
  - Verification of some specific standards of achievement.
  - Detection of poorly constructed items.
  - A first level of knowledge of the difficulties experienced by the subjects.

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Application

- Define the form of application (individual or group) and materials required (paper, pencil, etc.)
- Apply a one-week t-test to identify significant discrepancies in responses.
  - Consider the conditions for the application.
  - Physical conditions of the space
  - Luminosity and other weather conditions
  - Sound and interruptions
  - Ergonomics of equipment and furniture
- Material conditions and application
  - Quality of the material and its printing
  - Quality of the equipment
  - Clear and precise instructions
  - Performance time (timeout)
  - Quality of the evaluator/applicator
- Conditions of the subjects
  - Clarification and informed consent
  - Anxiety blocking versus challenging
  - Relationship with other subjects and evaluator
  - Physical and psychological well-being
  - Tiredness and physiological fatigue
  - Expectations in relation to objectives and expected results

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MSIE 4.0

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Thank You

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