# COACH_ING EDUCATIONAL MODEL: Train to Career

Viviana Callea[1], Apollonia Matrisciano[2], Mihai Ursache[3], Roberta Tempone[4], Isabella Chiarotto[5]

[1] FLY FISH SRL, via Gregoriana. 5, Rome RM 00187, Italy
viviana.callea@flyfish.it
[2] Civil and Industrial Engineering Sapienza, Rome RM 00184, Italy
lia.matrisciano@uniroma1.it
[3] FLY FISH SRL, via Gregoriana. 5, Rome RM 00187, Italy
ursache.mihai94@gmail.com
[4] FLY FISH SRL, via Gregoriana. 5, Rome RM 00187, Italy
robertatempone@gmail.com
[5] Civil and Industrial Engineering Sapienza, Rome RM 00184, Italy
isabella.chiarotto@uniroma1.it

**Abstract**
This article presents a new application of the COACH_ING model - integration of COACHing and INGegneria (engineering) skills model – to career which aims to identify the potential of trainees from the professional categories to possible fit them to their major ability.
The study started from the validation of two COACH_ING tools: DIRECT_ING, a questionnaire-based tool that assesses individuals' potential to cover professional categories, and Macro Capabilities (MCs), which evaluate behavioral and operative skills.
The article discusses the reliability of these tools using data from 100 samples of students who have graduated or were close to graduation. The results show that both tools have high reliability and can effectively assess individuals' skills and potential.
The article also discusses the history and objectives of the COACH_ING model, which seeks to define new MCs aligned with today's market demands. Furthermore, the study explores the tools and COACH_ING training methodology used in a university laboratory program, emphasizing the importance of equipping future engineers with complex and valuable skills applicable in the job market. The analysis of collected data highlights the relationship between professional categories and MCs, providing valuable insights for individual educational and career development. The article concludes with reflections on the results and implications for future research and practice to realise specific grid to monitor the growth of the trainees.

**Keywords:** Coaching, Engineering, Education, Job Market, Soft Skills

# 1 Introduction

## 1.1 Macro Capabilities and DIRECT-ING tools

The COACH_ING training model was born from the idea of the need to design a step-by-step engineer oriented and structured based coaching method for fellow engineer colleagues [1].

The purpose of such model is to assist in charting a path toward one's professional, personal growth and enhancement through the transversality of their skills and competencies [2].

It was noted during close observation that the career paths of engineers who were associated with companies or organizations accelerated more rapidly and effectively when supported by skills other than technical ones, more precisely, behavioural skills such as relationship building, communication and the ability to learn and adapt their behaviour to complex situations [3-4].

The COACH_ING model we have designed-already in the development phase of resource-allows engineers to equip themselves with new skills that address new market demands.

In fact, COACH_ING is an interactive training strategy which aims to transmit and build its platform around sixteen reference skills consolidated in coaching and engineering teachings; adaptability, assertiveness, communication, relationship building, creativity, decision making, initiative, social intelligence, self-investment, time and resources management, orientation result, prospective thinking, planning acumen, intercultural sensibility and all-encompassing vision [5-6].

The proposed model has been experimented over the arc of the last ten years with senior and junior engineers from the Council of Engineers of Rome and its Province, the faculty of Civil and Industrial Engineers from Sapienza University of Rome. As well, additional support has come from corporate technical professionals.

It is essential to introduce the following eight professional categories; research and develop, sales and marketing, operation, free-lance and entrepreneurship, project manager, finance and control, support services and human resources in other to identify the potential of trainees.

For each category we matched as many six skill sets taken from the COACH_ING model. The results of this work were presented at global Engineering EDUcation CONference (EDUCON) in the 2022 [7].

To achieve this objective, preliminary work was carried out that involved the application of a tool called DIRECT_ING (presented for the first time at International Conference on Environment Friendly Energies and Applications - EFEA21), formatted as a questionnaire it provides feedback on the individual's potential to cover several professional categories [8].

That trend was evidenced in responses to targeted questions associated to specific skill sets.

This tool has been revelated a useful way to guidance person to show his tendency to professional categories for the develop of his career fit with his potential abilities.

This tool has proved to be useful both in orientation and guidance to help trainees individualize their ideal professional categories to develop a career in sync with his or her aptitude.

Another tool of the model is composed of eight MCs, using this tool trainees can evaluate themselves and others. The eight MCs are: resilience, fast thinking, realization, confidence, courage, optimism, inspiration and flexibility. These MCs represent complex entities that characterize personal and professional profiles through a set of the behavioural skills (to be–COACH) and the operative skills (to do–ING) of the COACH_ING model.

Before entering into the heart of this article we wanted to validate the tools introduced thus far. The final goal of this work has been to offer those who participated in the trial a double awareness that, on the one hand encourages following their university path and on the other, provides the tools with which to design and structure their professional careers through a broader vision that comes with the capacity to define with confidence and determination (conscious decision-making) a career that corresponds not only to their graduate degree but to their inherent capabilities.

### 1.2 Validation of data gathering tools

Complex capability is a skill construct (latent magnitude) not directly observable; a capability includes different concepts for example from intellectual capability to standard requirements for every individual, needed to do a specific action. For this reason, the complex capability has been defined thru a set of observable elements (skills of model), where each element represents a different aspect of the same latent magnitude.

To validate the tools (DIRECT-ING and MCs) described, data relating 100 samples taken from students close to the graduation or recently graduated was used. In the case of the DIRECT-ING questionnaire responses graduated on the Linkert scale. To verify and control reliability of the questions using the Cronbach Alpha calculation method [9, 10] was chosen.

The reliability demonstrated also to be effective for the MCs. In fact, for each of the eight MCs the Cronbach Alfa obtained results respectively from 0,814 to 1 and 0,797 to 1 for the eight professional categories.

In particular, the professional category shown in the charts (Fig. 1) is finance and control. The graphs at the top refer to the overall scores of the respondents which vary according to the sample administered. The distribution of the scores is not symmetric. From the histogram the presence of a significant portion of respondents with low scores (left tail) is evident. The majority is concentrated in the middle of the distribution.

There is also a non-negligible group of individuals with very high competency levels (right tail of the distribution). This empirical evidence is corroborated by the second graph on the top right. The bottom left panel shows the distribution of the overall score in each item of the questionnaire. There is great variability among the items with low performances in the third item (building relationships), revealing the difficulties the individuals in the sample have in establishing a good network. Similarly, the bottom right panel shows how low are the scores in the third item. Only the first item has an estimated value above the mean.

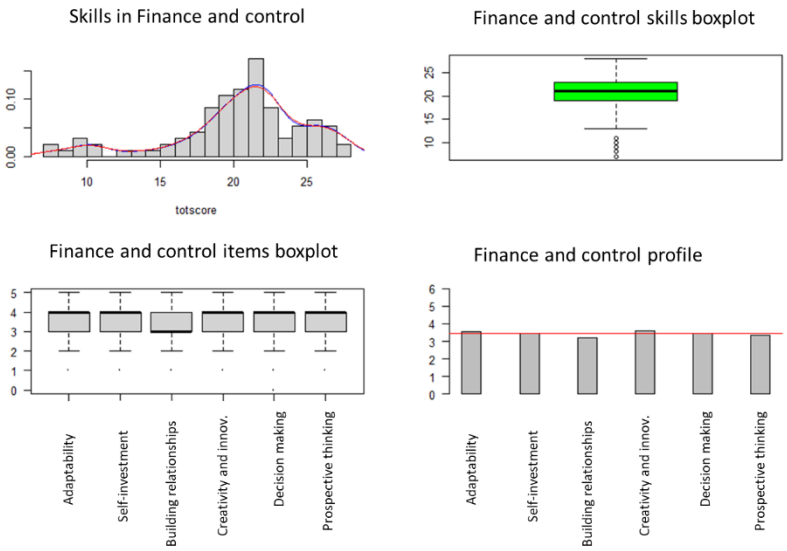


**Fig. 1.** Analysis relative to Alpha in a professional category

### 1.3 History: objectives reached and expected results

During the initial experimentation of the COACH_ING model we started from the observation of a single skill (sixteen comprise the model) as the indicator to specific behaviour patterns from an engineering and coaching perspectives, respectively.

Subsequently, it was necessary to adopt a more complex vision of behavioural patterns and skills from the samples in order to verify which MC (complex skills studied as emerging skills) arose from an integral observation of all the skills in play – selected from specific sets.

The approach used is inspired by a complex pattern [11]; observed behaviour such as emergent capabilities which are combinations of COACH_ING skills set.

The model proves to be a dynamic learning method (strategies, methodology) that aims to define new MCs useful in today's market place. These Capabilities may, over time be representative entire professional categories. These can offer flexible support to the recruiter. We present a dynamic model which is evidenced by market requests and which also reinforces our idea that the market seeks out new capabilities, ones that are in line with the pursue of digital and sustainable skills.

Our work consists, therefore, in building useful tools to match market needs with profiles in training through the development of abilities and knowledge that integrate specific/technical preparation in each individual course of study.

The purpose of this study is to construct competency assessment grids, both individual and combined, which become standard models to be utilised by university professors throughout academic and professional careers; to evaluate and have learners self-evaluate their own "learning" process and professional growth.

The process can be autonomously conducted by professors taking the following steps:

Allow students to access their own competencies (sixteen COACH_ING skills, eight MCs).

Provide them with guidance as how best to evaluate what the market offers (professional categories), i.e., that would entail understanding the different professional categories.

Evaluate the trend of their professional potential (DIRECT-ING).

Monitor the growth of these elements (Monitoring).

All of the above are implicit to the professor's task: to stimulate students during university path.

This kind of methodology is useful also to recruiters in the evaluation of candidates, to managers to the evaluation of their resources, etc.

## 2 Findings and conclusions

### 2.1 Tools and training methodology in the classroom

The study presented in this article is based on data collected from 100 samples who have participated in multiple editions of the innovative university laboratory program called "Entering the World of Work: Tools, Scenarios, and Strategies," up to the current ongoing edition titled "Soft Skills for Today's Engineer" [12, 13].

The experimental laboratory is conducted using the COACH_ING methodology, operating on two parallel levels: understanding the "individual" (distinctive traits of the individual) and understanding work contexts (organizations, professional studios, research world, etc.). All of this is aimed at equipping future engineers with the ability to acquire complex and valuable skills applicable in today's market scenarios.

The lessons are structured as theoretical stimuli and group workshops, as well as self and mutual evaluations and experiences in the context of technological work.

Through the self-assessment of the eight MCs and the results of the DIRECT-ING questionnaire, we have highlighted the relationship between each of the Professional Categories and the MCs for each future engineer. This is done in order to observe the potential expressed in individual samples as a valuable element for their personal educational and career development project.

Since each professional category is characterized by a set of six skills and each MC consists of a set of five skills, the level of proximity is highlighted between each individual professional category and the MC based on the common skills they share.

From the analysis of the data collected over the years, the weight of each MC within the set of each professional category is clear. Among the competencies with the highest weight, three have been chosen. A cycle of focus group conducted in the classroom was then formed to verify the students' perception in terms of the weight of MCs as associated with each individual professional category.

In the following graphs, the green arrows highlight the most representative skills chosen for each professional category during the focus groups; blue represents the

results of the first group work and orange represents that which has emerged from the data collected over the years.

During the classroom proceedings, each student was asked to assign a maximum of three MCs to each professional category. This was first conducted as an individual exercise among the students, using a work grid then, in a guided manner, organized into work groups using the focus group methodology. The collected data was then compared.

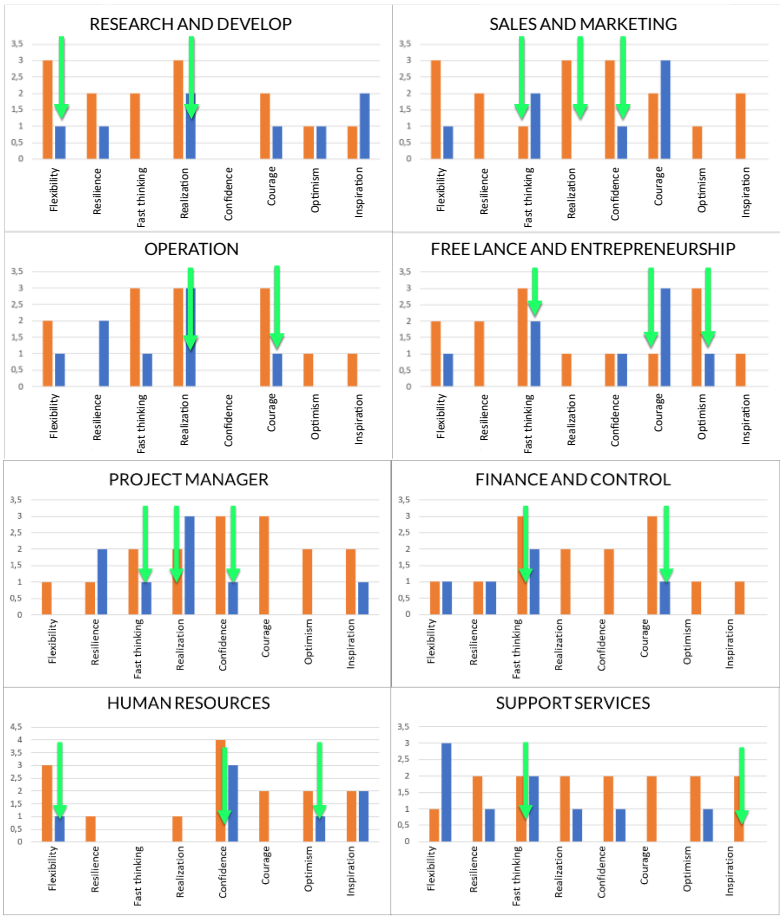


**Fig. 2.** Measure of proximity between professional categories and MC

In observing the predominant size of each category, we see the difference between skills perceived as necessary to excel at roles belonging to these professional categories compared to the association derived from the results of our analysis of the Model's skills. The groups discussed professional categories and offered a rational discourse as to the types of situations a typical professional might encounter.

Our analysis instead, is a quantitative measurement based on data collected over the past years. In other words, in blue and with the green arrows we see evidenced what the

subjects view as necessary. For this reason, categories such as “operations - specialist technicians” have a greater conformity while categories such as “support services” are less defined with less between “imaginary” and disclosed, as they are not known quantities to the student in course of development.

### 2.2 Data analysis and reflections for the future

It was also interesting to analyze the training model with the students themselves; in this way, they had the opportunity to work on their ability to choose the skills they wanted to develop. As well, their ability to give definition to their confidence and comfort level. Finally, they were able to reflect on their use in the surrounding context, being aware of their own personal predisposition.

In this way, they were also provided the opportunity to evaluate themselves as a "product" to be introduced onto the market with certain distinctive characteristics.

The natural evolution of the model will consist of transitioning from classification in professional categories, to identifying actual profiles, based not only on specific technical expertise but, with equal importance, on a precise set of MCs to be developed in each academic path.

This way, orientation towards the market will no longer be limited to the sector of specialization indicative to the course of study but will encompass broader professional opportunities, increasing the possibility of intersecting market demand and overcoming the increasing mismatch between demand and market supply, simply more prominent in this present day.

### 2.3 Conclusions

Over time, this approach will facilitate the construction of new MCs, linked to the socio-economic contours of the market, representative of required competencies and profiles.

It is clear that the sixteen skills will remain the standard referral in the COACH_ING model, while the inter-associations between professional categories and MC may undergo changes over time, due to; an increase in the number of samples studied and, as a result of changes in market needs.

Nonetheless, the questionnaire tool DIRECT-ING, enriched through the self-assessment of MCs, permits students to broaden their perspective on possible roles and to appreciate the flexibility of market demands in terms of soft skills and new aspects of MCs, during the ongoing transformation.

Finally, a direct confrontation with the students a dedicated one-on-one meetings (feedback), permitted us to highlight how useful self-reflection on the concept of combining skills and evaluating the opportunity to understand how the market may require specific behaviours and attitudes to fulfil ever-changing roles constantly in evolution: from the ability to manage multidisciplinary teams to the participation in intercultural projects, to remote planning (read digital skills), to sustainable planning (Green skills).

It would be interesting to observe from these new skills which competencies co-exist naturally and cannot be separated one from the other. In defining the additional

associations between competencies within the MCs, it is possible to establish newer standard sets that are more representative.

The aim is to identify functional dependencies among the various competencies that compose new MCs, in both the present and the future.

This means enriching the COACH_ING model with new data collection grids useful as a stimulus in training engineers in order to awaken them to their capacity to make choices fundamental to their career – hence, “Train for Career."

## References


1. Angel, P., Amar, P.: “Le Coaching”. Presses Universitaires de France, France (2012).
2. Cappiello, C.: “Il Coaching: nessuno in cattedra” (Coaching: Nobody in the Chair). Paper 1/15, Council of Engineers of Rome, Italy (2015).
3. Organization for Economic Co-operation and Development (OECD): “Transformable Skills training for researchers supporting career development”. World Science Forum, Brazil (2013).
4. Callea, V., Santini, E., Tempone, R.: “COACH-ING, an integrated system of skills: experimentation and guided validation”. EFEA, Roma (2018).
5. Spencer, L.M. Jr, Spencer, S.M.: “Competence at Work: Models for Superior Performance”. 1st edn. Wiley, United States (1993).
6. Whitmore, J.: “Coaching for Performance: The Principles and Practice of Coaching and Leadership”. 5th edn. Nicholas Brealey Publishing, United Kingdom (2017).
7. Callea, V., Tempone, R., Matrisciano, L., Ursache, M., Remigi G.: “COACH_ING EDUCATIONAL MODEL: analysis and application for business”. 2022 IEEE Global Engineering Education Conference (EDUCON), Tunisia (2022).
8. Callea, V., Tempone, R., Matrisciano, L., D'Andrea, A., Ursache, M., D'Angelo, G., Remigi G.: “COACH-ING: From model to tool”. EFEA, Bulgaria (2021).
9. Rasch, G.: Probabilistic models for some intelligence and attainment tests (Expanded ed.). In: University of Chicago Press, Chicago (1960).
10. Fischer, G.H. Molenaar, I.W.: “Rasch Models. Foundations, Recent Developments, and Applications”. In: Springer-Verlag, New York (1995).
11. Zangwill, A.: “A Mind over Matter: Philip Anderson and the Physics of the Very Many”. In: Oxford University Press, United Kingdom (2021).
12. Pujitha, S., Prasad KDV, Y.: “Complete And Competent Engineers: A Coaching Model To Developing Holistic Graduates”. In: 5th World Conference on Educational Sciences, pp. 1367 – 1372. WCES - Procedia - Social and Behavioral Sciences 116, Rome (2013).
13. Bettinger, E., Baker, R.: “The Effects of Student Coaching in College: An Evaluation of a Randomized Experiment in Student Mentoring”. In: Educational Evaluation and Policy Analysis, pp. 3-19. American Educational Research Association, United States (2011)