IFAC Industry Committee—Chair's Report
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Background
The IFAC General Assembly approved the establishment of a permanent "Industry Committee" at the World Congress in Toulouse, France, July 2017 as a result of an amendment to the IFAC Constitution. The Industry Committee is chaired by a new Vice Chair of the Technical Board, who is an *ex officio*, nonvoting member of the IFAC Council. The objectives of the Industry Committee include increasing industry participation in and impact from IFAC activities. For the 2017-2020 triennium, Tariq Samad was appointed the Industry Committee chair by the Council.

Membership Update
The Industry Committee membership roster is 83-strong—there have been about ten additions over the last year. The majority of the members are currently in industry and the majority of those who are not have spent most of their careers in industry. All sectors with significant control relevance are represented. The membership is also diverse geographically, with members hailing from over 25 countries, from all continents except Antarctica. Recommendations from the IFAC leadership for additional Industry Committee members are always welcome and would be appreciated.

Five workstreams have been set up and are active, as follows (see below for workstream reports):
- WS1: Industry/academia/government collaboration (Silvia Mastellone [CH], chair)
- WS2: Industry engagement in IFAC TCs and events (Philippe Goupil [FR], chair)
- WS4: Gleaning the "voice of the industry" (Alex van Delft [NL], chair)
- WS5: Educating control engineers for industry roles (Atanas Serbezov [US], chair)
- WS6: Industry Committee communication (Kevin Brooks [ZA], chair)

Another workstream, WS3 on "Industry engagement in IFAC publications," is currently dormant. However, aspects of publications are covered under other WSs.

An Executive Subcommittee (ExCom) has also been established to oversee the workstreams, manage membership, serve as a liaison to the Technical Board and the Council, and provide general direction to the committee. In addition to the WS chairs, the ExCom roster includes Roger Goodall (UK), Steve Kahne (US), Carlos Eduardo Pereira (BR), and Tariq Samad (US).

We have conducted and are continuing to conduct surveys of our members and the control community in industry more broadly and look forward to reporting results. (The committee report last year included results of one survey, which assessed perceptions of industry impact of various advanced control technologies, as well as other perceptions.) The committee needed access to a good survey tool for these purposes. After discussions with the IFAC President, Secretary, and Treasurer, IFAC has acquired a one-year subscription to SurveyMonkey recently. We believe it is important to continue this subscription and seek TB and Council support for it.

Workstream Reports

Workstream 1: Industry/academia/government collaboration
This workstream is chaired by Silvia Mastellone (FHNW, CH) and has 36 members. A mission statement has been prepared: Enhance industry-academic-government collaboration in the field of control with

the scope of enhancing technology and knowledge by: (i) Fostering knowledge exchange, (ii) Connecting industrial and government technology problems to academic solutions, and (iii) Establishing events and platforms for interaction.

The following activities are planned:
1. Identify emerging industry sectors (product or processes) and sectors related to socio-economical aspects related to control applications and disseminate to academics:
   a. Survey industry to identify requirements to achieve the next generation of product/processes
   b. Identify where control can have an impact and "translate" the requirements into control-related scenarios
   c. Publish a set of next-generation control problems
2. Identify academic works related to future industrial applications
3. Develop a networking strategy between research groups and industry clusters
   a. Identify the role of control in the digitalization era. Which tools are required, and which one have to be further developed?
   b. Publish results

Progress update:
- Activity 1: Survey industry to identify requirements to achieve next generation of product/processes: Survey was completed and set in SurveyMonkey and is being distributed. The survey aims to interview industrial/governments representatives on the nontechnical requirement specifications that future products and processes should fulfill.
- Activity 2: Brainstorm on representative futuristic control applications and identify sectors of control that fit the digitalization paradigm. Survey in preparation.

Workstream 2: Industry engagement in IFAC TCs and events
This workstream includes 39 members (24 from industry, 13 from Academia and 2 from governments). These include the TC Vice Chairs for Industry. The workstream chair is Philippe Goupil (Airbus, FR).

Broad objectives for the workstream, particularly for the next year, include the following:
- Involve/engage industry in IFAC more extensively
- Increase IFAC visibility in industry
- Detect, disseminate and apply good practices

2 surveys have been launched in 2018:
- How many members in each IFAC TC are from industry? At the moment 19 TCs have replied out of a total of 39 TCs. Mean participation is around 10% but with a standard deviation equal to 8. Only 2 TCs have an Industrial Working Group (TC 6.4 and 9.1).
- To get a better idea of industry participation in IFAC events, the WS2 chair now systematically receives IFAC event reports sent by the IFAC Secretariat. 33 reports have been analyzed so far: mean proportion of industrial attendees in IFAC workshops and conferences is 9.3%. It is important to make event organizers well aware of the quality of the reports to get the best estimation.

Two Webex meetings have been organized (11/01/2019 and 29/01/2019) to continue to enrich the collection of best practices. The main goal this year is to compile all feedback in a dedicated document

to be widely disseminated within IFAC. Ideas have been compiled in a FreeMind map to ease the analysis.

Workstream 4: Gleaning the Voice of the Industry
This workstream, chaired by Alex van Delft (DSM, Netherlands), includes 19 members.

Some findings over the past year that are helping drive WS4 activities are:
- IFAC may become more appealing to industry if it can be a place where industry practitioners can come to learn about and influence the "industry future."
- Participation in IFAC is not an imperative for industry. Potential "value streams" for industry participants should be explored.
- The concept of "advanced control" should be extended considering the reality in industry. Examples: Condition and process monitoring/diagnostics/prognostics systems, shared control, human-in-the-loop control, short-interval control, and machine learning.
- Efforts should be made to identify hot topics and the technological trend (or even buzzwords) in industry (e.g. CPS, IoT, blockchain, UAVs, ...) and to make a closer link to academia and IFAC activities.

The WS chair reached out to the process automation end user communities in Europe (i.e. Namur, WIB, EI, Exera, CLUI, EEMUA). Together they represent over 300 of the major process industries in Europe, and as such provide a representative "Voice of the Industry" for that sector and region. They committed to serve as a sounding board: Effectively tapping into the "Voice of the Industry" starts with identifying the right channels.

WS4 has partnered with WS1 in developing a survey that is now being distributed widely (see WS1 update above). Based in part on the results of the survey WS4 has the following plans for the next year:
- Summarize viewpoints on control, differentiated by industry sector. Do we see big differences across sectors/regions? What control-related issues are faced by different sectors? What are the real business problems that control can help solve in each sector?
- Sharpen our view on the issues that have led to industry's disenchantment with IFAC.
- Collect ideas from industry sectors on how they believe organizations like IFAC can play a role to keep industry practitioners "ahead of the game." We believe IFAC has the potential to become a forum to help industry envision and influence the (control-relevant) "industry future."

Workstream 5: Educating Control Engineers for Industry Roles
The mission statement for the workstream, led by Atanas Serbezov (Rose-Hulman Institute of Technology, US) is as follows: Establish the core competencies and key skills that industry expects for entry-level control positions at BS, MS and PhD levels. The workstream membership consists of 17 members, with 11 from academia, 5 from industry, and one retired.

Over the past year, the focus has been on the BS level, and more specifically on the content of the one and only control course required by many engineering programs around the world. Instructors teaching this course are faced with a challenging task to design a syllabus that provides the right balance between fundamental theory and practical applications, and fosters technical skills relevant to entry-level industrial control positions. This is a joint effort between TC 9.4 on Education and Workstream 5.

A survey questionnaire was developed and implemented for mass distribution in a custom-built web application. The survey pilot was distributed to select groups, including the entire Industrial Committee. Industrial participation in the pilot study was 30%. Feedback was sought not only on the topics to be included in the first control course, but on the design and administration of the survey itself. The results from the pilot will be presented at various meetings in order to draw visibility to the survey and encourage participation in the finalized version of the study.

The survey pilot revealed that the administration of the survey and the analysis of the results could be significantly improved if a commercial product, such as SurveyMonkey, were used. We are thankful to the IFAC Secretariat that such a tool is now available to the Committee.

Over the next year, improvements in the survey are being made with the intention of distributing it to the global control community. The survey will be promoted at the following events sponsored by IFAC:
- 2019 Experiment@International Conference, Madeira, Portugal
- 2019 European Control Conference, Naples, Italy
- 2019 Advances in Control Education, Philadelphia, USA
- 2019 American Control Conference, Philadelphia, USA

Participation in the survey is essential for the quality of the results. Members of the Industrial Committee will promote the survey to other professional societies, such as ISA and NAMUR. The goal is to have at least 50% industrial participation in the survey. The results will be presented at the 2020 IFAC World Congress and published in the IFAC *Journal of Process Control*.

Workstream 6: Industry Committee Communication
Workstream 6 is chaired by Kevin Brooks (BluESP, South Africa) who has recently taken over from Lucia Quintero Montoya. Four other industry committee members are participating in the workstream.

The main goal for this workstream is to develop strategies to promote Industry Committee results and initiatives through e-channels, enroll new members, and increase the committee's visibility. In this context, the workstream is promoting the activities of the Industry Committee (starting with the Executive Committee) over a variety of channels:
- A linked-in group aimed at providing pushed information to the entire committee – see https://www.linkedin.com/groups/8338328/
- A facebook page- https://www.facebook.com/IFACIndComm
- A Twitter presence - https://twitter.com/CommIfac
- A document store - https://taskforce.ifac-control.org/industry-committee

The linked in group has 63 members. There are 11 followers on twitter.

Some future initiatives include:
- A "light" website, to be updated monthly
- Youtube channel (panel sessions and project videos)
- Instagram (cool pictures from meetings)

It is expected that this workstream will collaborate with the IFAC social media leaders as it makes progress on developing content for digital channels. Appropriate introductions have been made to this effect.

The workstream is therefore set up from a technical point of view. What is now required is the content to keep members interested! We encourage IFAC volunteers to

Current and Future Activities
The Industry Committee continues to forge ahead on several fronts. Our primary objectives for the remainder of this triennium are outlined below.

Collect and promote industry success stories. As noted above, even within the control research community the practical successes of control are not appreciated. We need to be better at patting ourselves on our collective backs!

Better connect control with "hot topic" technologies of industry interest. Control science is a key discipline for furthering the development of emerging technologies such as deep learning, autonomous systems, internet of things, and quantum computing.

Develop recommendations for IFAC Technical Committees and IFAC events. A few TCs are reasonably successful at attracting industry participation, including for their conferences and other events, but most of them (including most of the application-oriented TCs) are not. An important goal of the Industry Committee is to help all TCs enhance industry participation in their activities.

Disseminate the industry perspective to interested control researchers. Why is industry interested in advanced control? What challenges are faced by control researchers in different industry sectors in commercializing control technology? Every industry sector brings its own requirements and intricacies, including regulatory oversight, commissioning processes, supply and value chains, and modeling and identification methodologies.

Increase awareness of "innovation" ecosystems. In addition to targeting positions in academia and established corporations, engineers and scientists are increasingly embarking on entrepreneurial ventures as well. Several control scientists have had notable successes with start-up companies, but many in our community are unaware of opportunities or how best to pursue them.

Develop recommendations for an industry-relevant first course in control for undergraduate students. Most engineering undergraduates are not specializing in control, yet they should all be exposed to the discipline. We are coming up with guidelines for a "first and only" control course (this activity is in collaboration with TC 9.4, Control Education).

Enhance industry content and relevance for the 2020 IFAC World Congress in Berlin. This event should provide a good target for some of the first outputs of the Industry Committee. We are also encouraging submission of industrial invited sessions, industry papers, and open industry benchmark problems from the broader IFAC community. The Industry Committee will discuss ideas and opportunities with the World Congress organizers.