Striving for Global Stability - an IFAC Agenda.

Summary Report from the TC 9-5 Chair and Young Member (ECAS) Working Group Chairs

Panel Organisers and Main Contributors

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1. BACKGROUND AND CONTEXT

Since IFAC was established in the 1950s in a post-world war two cold war context, the international system has changed in very fundamental ways. Nevertheless, IFAC clearly remains very relevant and retains a strong and active membership, not least in TC 9-5 which deals with control and automation scientific engagement with the international system. Today there is an intensifying sense of crisis in international affairs, especially but not solely related to the fact that we now have the highest number of displaced peoples since world war two, a situation predicted by Dr. Fred Kile, former chair of TC9-5 as far back as the early 2000s (Kile (2003), Kile (2006)). A broad ongoing discussion within the TC membership has continued since the 2011 World Congress. At IFAC WC 2011 in Milan the then Technical Board Chair, Professor Iven Mareels, communicated the views of the TB in respect of deepening an inter-disciplinary engagement between control and automation engineering and other communities interested in international stability and culture issues. Through Professor Mareels and in agreement with the TC 9-5 leadership, a need to obtain the broadest set of expert perspectives and synthesise these into formal publications, events and activities was identified, as well as a need to introduce fresh perspectives into this domain and encourage activity amongst young, emerging researchers. This report originates in the Milan discussions and the TB views which were warmly welcomed by TC 9-5 members generally. Since Milan, a TC 9-5 "Young Members" group was nurtured and formalised (in 2015). It is this working group that has driven the present study, conducted primarily during the TECIS 2016 event in Albania in October 2016. The study presented here therefore aligns directly with explicitly stated objectives of the TC as guided by the TB going back several years.

2. THE INITIATIVE

TC 9-5, and especially driven by the TC 9-5 Young Members Forum leadership, collected a series of multi-disciplinary and intergenerational contributions which examined international stability issues from engineering and non-engineering perspectives. The primary purpose of this research was to engage participants in debates happening outside the immediate IFAC domain of thought across generations, nationalities, domains of expertise. The study was organised in such a way as to include private, NGO and academic sectoral viewpoints, as well as the views of new IFAC members and international engineering student networks. The study provided a basis for a TC9-5 agenda review and for establishing important priorities for this large and active technical committee. This paper reviews the results of data gathered during a number of IFAC meetings which explored IFAC member perspectives on current global stability challenges and system features. The findings collect and synthesise the views and priorities of a range of IFAC members across various groups, including younger and older members. The paper summarises what members believed could be concrete IFAC actions for future engagement across the control and automation community and with external agencies in the context of particular priorities. It synthesises key findings with a view to contributing to the IFAC international engagement agenda and frames a wider discussion about IFAC aspirations and actions, especially in CC9 and TC 9-5.

Data is presented here from the recently convened WG "IFAC TC9-5 Young Members Forum" formally established in 2015 but active since 2013 (and recently renamed as "Working Group for Emerging Control and Automation Scientists and Engineers for International Stability (ECAS)"). This initiative was supported by the TC chair and vice-chairs team, as well as the broader membership and working group chairs and included a series of open "Reflective Meetings" during the TECIS 2016 event as well as a final panel and reflective cell group session. These contributions and reflections were recorded by the WG and TC chair who synthesised the main contributions, themes and insights from this exercise.

3. GLOBAL STABILITY: AN IFAC AGENDA.

The overall objectives of this panel and its associated discussions and reflection sessions can be summarised as:

1. Development of key themes to be examined over the next two years by the Young Researchers WG and TC 9.5.

2. The creation of an interdisciplinary, intergenerational network/ working group

3. The identification of new, appropriate and relevant modes of engagement between IFAC (especially TC 9-5) and external agencies

The panel session used an innovative approach based upon established pedagogical principles for reflective learning. A kind of pedagogical "experimental" engagement of TC 9-5 members was therefore involved in order to achieve the above goals. The primary innovation was to establish a formal "reflection" group whose task it was to reflect upon the conference proceedings at the end of each day. The reflections were guided by the Young Members WG Chair with the support of the TC Chair and IPC Chair to ensure discussions were on track and within the general scope and agenda of IFAC generally and TC 9-5 in particular. Themes arising from the non-profit, civil society and industry perspectives were included in the framework for the discussion to ensure that the discourse was not only framed in purely academic terms.

4. SUMMARY OF FINDINGS

This section sets out summary findings for the daily reflective sessions and for the main panel session incorporating focu8s cell groups at the end of the TECIS 2016 event.

Daily Reflective Sessions

At the end of each day reflective sessions were organized during which participants were incited to share their reflections on the events of that day and most particularly the implications of various contributions for the community vas an active, research and practice driven group. Plans were proposed with the details of the minutes of each reflection meeting and the panel session, written up into a document for circulation to the technical committee membership. This document is to include contributions from the members of the reflection group under the coordination of the Young Researchers Forum and will involve a rewrite and expansion of this contribution.

The main thematic areas associated with international stability, control and automatic systems in which contributions were made during the reflection sessions can be summarized as follows:

1. Global instability: Conflict and Climate Change

2. The European Migration Management Crisis

3. Political extremism and the future

4. Working towards a stable, sustainable future

The groups were invited to suggest potential actions and engagements which might be possible within the structures of CC9 and especially TC 9-5. These contributions are summarised as follows:

1. TC 9-5 Young Researchers WG (YRWG)[i]: It was agreed that an event involving emerging research students designed to actively promote learning and knowledge sharing could be organised which focussed upon the above thematic areas. It was recognised that such an initiative would need support and assistance from more experienced researchers with IFAC. Young researchers particularly felt they needed assistance in the construction of contextual frameworks, especially conceptual models which linked theory and practice. Members of the YRWG also felt that help was needed to create new networks and create and nurture new relationships between researchers and others who were new to IFAC and established IFAC communities and cooperating organisations.

2. IFAC CC9/TC 9-5 Agenda: It was recognised that, in light of the changing international context, a new agenda might be formulated (or at least debated). This should focus on the current major issues in Europe (the conference was held in Europe so most delegates were Europeans) and elsewhere. The role of TC9.5 but also IFAC in general was discussed and it was recognised that a range of possibilities existed to expand control and automation systems engineering and scientific work activities into new areas.

3. Valorisation of New Perspectives: The reflections recognised "tremendous positivity" associated with "running an event in Albania", which was a developing, non IFAC member country (at the time of the sessions). The idea of using an international stability agenda within CC9 to promote the IFAC organisation into new member countries and encouraging new members with new and diverse perspectives into the IFAC family was recognised as an important thrust of CC9/TC9-5 work. This is especially important in light of IFACs core values around being an apolitical and inclusive scientific community.

Panel Session Focus Groups Findings

Following the daily reflection session a panel session was organised gather IFAC members' views on key questions facing our community. At the last session of the conference an invited panel gave short, stimulating presentations designed to foment discussion. At the end of the four short presentations attendees were organised into small focus groups and, using the presentations as a launch pad for cell discussions, were asked to provide three main points of consensus in the cell group for consideration by the technical committee, represented by all attendees. At the end of the cell group session, the themes were gathered, recorded on a flip chart and discussed and clarified in the full session. The restriction to 3 priorities for each cell helped focus the session (as is usual in focus group techniques). To stimulate a broad range of inter-generational and inter-disciplinary viewpoints the presenters included a senior control science academic, a senior industry representative also possessed of a strong engineering academic background, an NGO representative (MITRajectoriores) and a delegate from a major European engineering students' network (ESTIEM). The session was overseen by the technical committee chair who attempted to draw out both linkages and incongruences between the presentations in order to stimulate debate in the cell groups. As some of the discussion points were likely to be sensitive in light of the variety of views and the difficult nature of the problems faced in the current international system, the TC chair emphasised the standing of IFAC as an apolitical community concerned with a positive engagement of control and automation systems researchers and practitioners in global, regional and local challenges.

Cell Group Data

This section unpacks the cell focus group data which arose from the panel session. It briefly unpacks the contributions of each of the cell groups, one by one, in the context of the work of CC9 and TC9-5 in recent years.

Cell group 1 opened the debate by suggesting that IFAC aspirations be revisited in light of the changed international situation since its inception in post-world war 2. IFACs core values such as its non-political status and inclusive approach to building community based on a focus on the application of control and automation engineering systems disciplines to the problems and challenges facing humanity remain important and very relevant, perhaps more relevant than ever. On the other hand, whilst the barriers between East and West which were so stark in the 1950s have fallen away (at least somewhat) in recent years, new barriers have been erected which challenge the capacity for global institutions to build all the bridges it might wish to build. The session discussed the difficulties for less developed regions to participate in some of the most important IFAC events, an issue which is unpacked below in more detail. The terms "automation" and "automatic" were debated at some length and questions arose as to the appropriateness of these terms in light of the new waves of technology in play in the international system. Is the term "automatic" a good way to describe the systems and technologies IFAC engineers and scientists are working on? Do we need other language so as to remain contemporary? The cell group also proposed that "not only [scientific and engineering] theoretical" people should be engaged to contribute in the work of CC9. This was discussed at length and there was broad agreement amongst the technical committee membership that IFAC needed to be opened up to policy-makers who "steered society" and "shaped societal effects" which were the subject of our CC9 work. An emphasis upon policy making has been seen in inter-disciplinary contributions to TC 9-5 in recent years (see for example FitzGibbon and Dennehy (2012)).

The cell group made a concrete recommendation for which there a broad consensus amongst attendees was the need to establish priorities and actions which identified "streams of societal development based upon academic tools and [new] scientific collaborations". This fits very well with CC9 as a "Social Effects" coordinating committee and especially with TC 9-5 and TC 92. Finally, the cell group felt it was particularly important for IFAC CC9 (and TC9-5 especially) to find ways by which to enable younger scientists to "join streams of creating new societal impacts". One way to achieve this (as a starting point) is to create a CC9/TC 9-5 award for best YMF TC9-5 contribution at TC9-5 events. [Post script: following TECIS 2016 IFAC announced a young member award for future IFAC World Congresses].

Cell group 2 believed that IFAC should make concrete plans and draw up policies to reduce the isolation of IFAC members in the less developed world, and to better enable less developed regions to participate fully in IFAC events. It was acknowledged that IFAC had already shown intentions in this direction, and the symbolic importance of the IFAC World Congress in South Africa underlines this. TC 9-5 regularly hosts events in less developed and more marginalised communities, and in the most recent technical committee meeting, bids were accepted for conferences in Azerbaijan and Bulgaria. Cell group 2 also believed that IFACs position as a global force in control and automation engineering and systems, coupled with the inter-disciplinary nature of CC9 and especially TC 9-5, mean it was uniquely placed to identify and set out lessons from exemplars of "what works" in relation to such critical international issues as the displacement of

peoples following conflict. In the past five years several contributions have appeared which directly or tangentially touch on similar themes and, in some cases present exemplars, including enterprise supply-chain networks perspective on human trafficking (Stapleton et al (2012)), advanced biomedical systems deployment in post-conflict regions (Kealy and Stapleton (2015a) and (2015b)) and automated microfinance applications in less developed regions in Africa (Stapleton (2011)). Contributions which focus specifically on exemplars of control and automation applications in respect of human community displacement are urgently needed.

Cell group three, like other cells, emphasised the need to create mechanisms by which to share perspectives between and across disciplinary boundaries. They particular focussed their comments upon the need to address systemic complexity, which is so much a feature of current international systems. This is clearly an area in which IFAC can make a significant contributions which are not only confined to CC9. For example, Technical Committees such as TC 1.4 (Stochastic Systems), TC 5.4 (Large-Scale Complex Systems) and TC 8.4 Biosystems and Bioprocesses are well positioned to offer theoretical and practical insights into the ways in systemic complexity impinges upon the international systems and, from there, point to new solutions by which to create control and regulatory mechanisms to maintain systemic stability. In TC9-5 there is a long tradition of this kind of work but with less prevalence in recent years (e.g. Dimirovsky (2003), Tsyganov (2012)). It was felt that this thematic area needs to revisited and expanded within TC 9-5 specifically and IFAC more generally.

Cell group four felt that an important priority was to "create a platform" for people who offered (and especially who implemented) "socially responsible" systems engineering solutions which addressed societal effects, Like other cells, the group felt that an important priority was to identify, profile and present exemplars which highlighted ways by which IFAC research and outcomes could be designed and deployed in socially-responsible ways. This discourse was very much in the long tradition of TC 9-5, especially the working group on Engineering Ethics (for example see Stapleton & Hersh (2004), Hersh (2012)).

The cell group ended on a hopeful note. They offered the idea of "Networks of Hope" to be established through the auspices of IFAC in which communities of academics and practitioners across the world communicated and collaborated with each other in new and dynamic ways. These networks would connect hubs of academic activity with projects "on the ground" in, for example, NGOS. These networks would be focussed on a social concept of "value added" which emphasises the IFAC core values of inclusivity and outreach. In essence these networks would become what the forum described as "communities of hope" during these most uncertain and troubling times. The relationship between control and automation systems and hope in, for example, post-conflict regions, has attracted the attention of TC 9-5 researchers with some important contributions in recent years (e.g. Kealy & Stapleton (2015a) & (2015b)). This was a most encouraging contribution of cell group 4 because it was clear that it aligned very well with both the original IFAC vision as well as its primary institutional structures of CCs and TCs of thematic areas which help build bridges between national level organisational structures (NMOs). The main thematic priorities arising from the cell groups are summarised in table 1.

Cell 1 **Priorities**	**Cell 2** **Priorities**	**Cell 3** **Priorities**	**Cell 4** **Priorities**
Rethink basic aspirations of IFAC	Reduced isolation of less developed regions	More sharing of perspectives	Create exemplars of "socially responsible.. real world" solutions
Greater involvement of policy makers	Greater sharing of knowledge	Capability to review all levels of system complexity	IFAC "networks of hope" connecting hubs and projects
More involve-ment of young scientists to create positive social impact	Exemplars of what works re: displacement following conflict	IFAC as a case study of global social system interaction	create inclusive socially "value added" systems

Table 1. Summary of Priority Activities and Research Themes for IFAC & CC9

5. CONCLUSIONS AND CONCLUDING REMARKS

This report summarises the findings of a study of IFAC members attitudes about IFAC in light of the international system which was mainly organised by the TC 9-5 Young Members WG. They focus on the role of CC9 and TC 9-5 in particular, whilst paying attention to the role of IFAC as a unique, global community of scientists and engineers. This was an unusual initiative which sought rich data on members' perspectives as a basis to drive the technical committee agenda into the next triennium. Following the study, and recognising the success of the young members forum as an

engine for positive change in the technical committee, a proposal was made by incoming (nominated) chairperson Professor Peter Kopacek of the Technical University of Vienna and supported by Professor Petros Groumpos of the University of Patras to form the YMF into a new working group of "emerging control and automation engineering research". The proposal has been reviewed and supported by the IFAC Secretariat and is supported by the TC9-5 chair. The findings summarised here have subsequently, been combined with other related work in 2015 and synthesised into a draft paper submitted to the IFAC World Congress 2017, and is currently under review.

6. ACKNOWLEDGEMENTS

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[i] The Young Members Working Group Forum has been renamed the **Working Group for Emerging Control and Automation Scientists and Engineers for International Stability (ECAS)**