

# A Sustainable Association Case Study: IFToMM Member Organization Turkey

Gökhan Kiper<sup>1</sup>[0000-0001-8793-724X] and Eres Söylemez<sup>2</sup>[0000-0003-2324-959X]

<sup>1</sup> İzmir Institute of Technology, İzmir 35430, Turkey

<sup>2</sup> Middle East Technical University, Ankara 06800, Turkey  
gokhankiper@iyte.edu.tr

**Abstract.** As a member of IFToMM founded in 2011, Turkish Machine Theory Association's (MakTeD) structure has put special emphasis on sustainability of the association and initiated several activities for improving the quality of education and research in mechanism and machine science area, hence supporting the SDG4 Quality Education of the UN. This paper presents the activities and methodologies of MakTeD. The paper starts with a brief history of mechanism and machine science in Turkey. In 10 years MakTeD organized 4 symposiums, 1 conference, 4 summer/winter schools, 8 workshops and hosted an IFToMM Executive Council meeting. Each chapter of the biyearly held National Symposium on Theory of Machines is held by a different university and especially newly established and the universities in relatively smaller cities are prioritized in order to promote those universities and to contribute to development of these universities. Especially the summer/winter schools and workshops have a wide-spread impact on mechanism and machine science education and research at the universities and institutions. MakTeD also contributes to the community with published books and support programs for young researchers.

**Keywords:** SDG4, Theory of Machines, Civil Society Organization, Sustainability of Association.

## 1 Introduction

Founded in 1969, the primary aim of International Federation for the Promotion of Mechanism and Machine Science (IFToMM) is to promote research and development in the field of Machines and Mechanisms by theoretical and experimental methods, along with their practical application and to broaden contacts among persons and organizations of different countries engaged in scientific or engineering work in the field of Machines and Mechanisms, or related sciences. Another aim of IFToMM is to assist the developing countries in their work in Mechanism and Machine Science (MMS) by sponsoring the visits of experts, organizing special courses, and other undertakings [1]. IFToMM community has aimed and still aims promotion of MMS especially in under-developed and developing countries.

Turkey has been accepted as a member organization during the 13<sup>th</sup> IFToMM World Congress in 2011. In the same year, the Turkish Machine Theory Association

(MakTeD) [2] was established as a civil society organization of Turkey. The charter of MakTeD has been written in parallel with IFToMM aims. MakTeD aims to promote national research and development activities, international collaboration, national and international mobility, and financially and technically support young researchers in MMS or associated scientific areas [3].

MakTeD has put special emphasis on the sustainability of the association and promote quality education since its establishment, hence supporting the Sustainable Development Goal (SDG4) about Quality Education of the UN. This paper presents the activities and methodologies of MakTeD as a good example of a sustainable organization for education and research. The paper also aims to document the activities of IFToMM Member Organization Turkey (a.k.a. MakTeD) in its first 10 years.

## **2 Brief History of MMS in Turkey and MakTeD**

In Turkey, studies on MMS can be said to be started with Prof. Bekir Diziođlu. Having obtained his Ph.D. degree from Dresden University, Diziođlu returned to İstanbul in 1947 as a faculty member at Istanbul Technical University (ITU), which was the only technical university in Turkey in those years. Diziođlu went back to Germany in 1960, but he kept close ties in Turkey and his two students Fuat Pasin and Mustafa Köseođlu taught mechanisms and dynamics of machinery courses. The MMS field at ITU was very much influenced by the German school.

After 1960's several new technical universities were founded in Turkey. One of the most influential engineering school was Middle East Technical University (METU), which was based on American engineering education system and language of instruction in English. Due to the need of instructors for these technical universities, in late 60's several graduates of METU and ITU went abroad (mainly to United States and Great Britain) in all different fields of engineering to continue their graduate studies and a big percentage returned in the first half 1970's. In several Turkish Universities small groups working on MMS were formed.

In 1984, with the support of Turkish Scientific Council of Turkey, National Symposium on Theory of Machines (UMTS) was initiated. The first symposium was held at METU, Ankara. In the first symposium there were 60 attendees. It was decided to held this symposium every other year. 20<sup>th</sup> chapter of the symposium series will be held at Dicle University, Diyarbakır on September 2021.

In 2011 it was found that there were a satisfactory number of young academicians working on MMS. MakTeD was founded in accordance with the Turkish laws and MakTeD formally applied for membership to IFToMM. Together with the establishment of MakTeD, UMTS started to be held under the patronage of MakTeD starting with the 16<sup>th</sup> chapter in Atatürk University, Erzurum in 2013. Besides the symposia, MakTeD started organizing national/international summer/winter schools, workshops and also hosted an IFToMM conference. In addition to the organized activities, MakTeD has some support programs for young researchers.

### 3 MakTeD Activities and Supports

This section summarizes the activities and supports of MakTeD. The activities are grouped as the National Symposium on Theory of Machines, summer/winter schools and workshops; published books and other activities. Also, MakTeD supports for programs for young researchers are briefly explained.

#### 3.1 The National Symposium on Theory of Machines (UMTS)

UMTS has been organized biyearly since 1984 [4]. Together with a historical review of MMS studies in Turkey, Sabuncu listed the main paper topics in the first 15 UMTS chapters as mechanism science, mechanical vibrations, dynamics of machinery, acoustics, automotive, control, agriculture machines and others (education, etc.) [5]. It is noted that not only academicians from Turkish universities, but also several researchers from institutions, companies and foreign universities have attended the symposia.

An important aspect of UMTS is that each chapter is being held by a different university (Fig. 1 – except for years 1986 and 1999) and especially newly established and the universities in relatively smaller cities are prioritized in order to promote those universities and to contribute to development of these universities. Many undergraduate or graduate level young researchers meet in UMTS and collaborate later on in their professional lives.



**Fig. 1.** The universities that organized the UMTS chapters.

Until 2013, the next UMTS organizer would be decided by the attendees during an UMTS. Starting with 2013, UMTS started to be organized under patronage of MakTeD, where universities apply MakTeD by filling in an application form and the organizer is decided by the MakTeD members by grading all applicants according to specified criteria. Such an application procedure motivates competition, increases the quality of the symposium and the decision is well received by the community.

UMTS proceedings play an important role in Turkish MMS literature. As an indicator of widespread impact of UMTS proceedings, a Google Scholar search reveals 541 documents and citations to UMTS (UMTS proceedings before 2005 are not available online). As a special case, UMTS 2015 was organized with international participation with the name TrC-IFTToMM Symposium on Theory of Machines and Mechanisms (TrISToMM), where 100 Turkish and 23 English papers were presented.

### 3.2 Summer/Winter Schools and Workshops

2 summer schools, 2 winter schools and 8 workshops were organized under patronage of MakTeD in 2013-2020 period (Table 1) [6]. IFToMM Summer School on Mechanism Design for Medical Applications (2018) and Workshop on Methodologies for Increasing the Positioning Accuracy of High-Acceleration Parallel Robots Used in Industrial Applications (2019) are international events, whereas the others are national events.

**Table 1.** Summer/Winter Schools and Workshops organized in 2013-2020.

Event Name	Date	Venue
Online Workshop on Graphical Methods in Kinematic Synthesis (KS2020)	7-12 Sept. 2020	Online
Workshop on Methodologies for Increasing the Positioning Accuracy of High-Acceleration Parallel Robots Used in Industrial Applications	20-21 Nov. 2019	Middle East Technical University, Ankara
Workshop on TRIZ (Creative/Innovative Problem Solving Technique) New Product/Process/Technology Development	30-31 Jan.-1 Feb. 2019	İskenderun Technical University, Hatay
IFToMM Summer School on Mechanism Design for Medical Applications	17-22 Sep. 2018	Izmir Institute of Technology, İzmir
Workshop on Fundamental Dynamics of Machinery Education	29 Jan.-3 Feb. 2018	Ondokuz Mayıs University, Samsun
Workshop on 3D Printers and Additive Manufacturing	18-22 Sep. 2017	Middle East Technical University, Ankara
Workshop on System Dynamics and Control	31 Aug.-3 Sep. 2016	Hitit University, Çorum
Workshop on Robot Dynamics and Control (RDK 2016)	3-6 Feb. 2016	Gazi University, Ankara
Workshop on Robot Kinematics (RKC 2015)	31 Aug.-3 Sep. 2015	Gaziantep University, Gaziantep
Winter School on Dynamics of Machinery: Theory and Applications	2-8 Feb. 2015	Middle East Technical University, Ankara
Winter School on Kinematic Synthesis (KS2014)	3-8 Feb. 2014	Erciyes University, Kayseri
Summer School on Kinematic Synthesis (KS2013)	2-7 Sep. 2013	Izmir Institute of Technology, İzmir

Just as IFToMM, MakTeD's main focus is to promote MMS among young people. Each summer/winter school or workshop organized has been conducted by voluntary presenters with an average of 30 participants, most of which are under the age of 30. Interestingly, almost %40 of the participants in these events were not university affiliated. Except for the international summer school, where there were several invited speakers from all around the world, participation to all these events were free of charge, expenses being sponsored by MakTeD and the organizing university and

sometimes by a branch of Turkish Chamber of Mechanical Engineers or a private company.

Most of the events organized so-far are specifically intended for young academicians in order for them to learn from competent researchers and improve their teaching and research activities. MakTeD administrators believe that such events are very important in increasing the level of university education in MMS and aim for the sustainability of these events by organizing one or two every year. Besides the technical benefits, participants strengthen their professional network and the bonding within the community increases. Fig. 2 presents a picture taken during the gala dinner of Workshop on Fundamental Dynamics of Machinery Education.



**Fig. 2.** Participants of Workshop on Fundamental Dynamics of Machinery Education - Samsun, 2018.

### 3.3 MakTeD Books and Lecture Notes

MakTeD also aims to contribute to Turkish literature on MMS. MakTeD possesses a publisher certificate since 2015. Proceedings of 2015, 2017 and 2019 have been published by MakTeD and the electronic versions of UMTS proceeding books since 2005 are freely available at MakTeD website [7]. The notes of Workshop on Robot Kinematics (RKC 2015), Workshop on Robot Dynamics and Control and Workshop on Fundamental Dynamics of Machinery Education were compiled as 3 books in Turkish by Prof. Özgören and published by MakTeD [8-10]. There are also appendices in [8-9] which are short Turkish-English dictionaries for robotics terms. The MakTeD book cover pages are illustrated in Fig. 3.

Besides the published books, MakTeD Web-page serves as an archive for notes of workshops and other lecture notes. Lecture notes on System Dynamics and Control [11] are notes from Workshop on System Dynamics and Control held in 2016. Turkish and English lecture notes and videos of Prof. Söylemez on Mechanisms are also available online [12].



Fig. 3. MakTeD books.

### 3.4 Other Activities, Supports and International Collaborations of MakTeD

Besides UMTS and workshops as the routine events, there are two international events organized under patronage of MakTeD. The first one is MeTrApp 2017 - The 4th Conference on Mechanisms, Transmissions and Applications organized at Karadeniz Technical University, Trabzon in 2017 and the IFToMM 2<sup>nd</sup> Face-to-Face Executive Council Meeting at Middle East Technical University, Ankara in 2019.

In 2018, MakTeD started the “Young Researcher Fund” support program [13]. The program is inspired by the IFToMM Young Delegates Program [14] and works in junction with it. The program provides financial support to young MakTeD members (age 35 or less) for attending IFToMM affiliated events. With this program, MakTeD aims to increase mobility of young researchers.

Turkish researchers have been attending IFToMM events since very early times of IFToMM, but the level of participation has considerably increased in the last 10 years. Promotion and supports of MakTeD have important effect in this increase. The increase in communication resulted in increase in mobility, exchanges and international collaboration in the form of joint projects and publications.

## 4 Conclusions

This paper presents the activities and methodologies of IFToMM member organization Turkey, a.k.a. Turkish Machine Theory Association (MakTeD). In recent years, certain unfortunate events about some members of IFToMM resulted in severe problems, even at the level of termination of membership. Having witnessed these problems, as a relatively new member of IFToMM, MakTeD has worked on establishing a sustainable association. Being founded as an official civil society organization, MakTeD has raised considerable amount of capital which ensured organization of large-scale events and small workshops with free-of-charge participation for especially young researchers. Hundreds of researchers have attended and benefited from these events in the last 10 years.

MakTeD activities mainly aim to increase quality of education and research in the MMS field in Turkey. The activities will continue by organizing and supporting event series and standalone events such as the 20<sup>th</sup> National Symposium on Theory of Machines (UMTS 2021) in September 2021 and 6<sup>th</sup> Turkish Robotics Conference in July 2021. Meanwhile, the positive developments in MMS community in Turkey also result in increase in global contribution to MMS.

## References

1. IFToMM, IFToMM Constitution and By-Laws 2019 (2019), <http://iftomm.net>
2. Turkish Machine Theory Association Homepage, <http://makted.org.tr>, last accessed 2021/05/12.
3. Makina Teorisi Derneği, Makina Teorisi Derneği Tüzüğü (2019), <http://makted.org.tr/eski/belgeler/tuzuk.pdf>.
4. Makina Teorisi Derneği, Ulusal Makina Teorisi Sempozyumu, <http://makted.org.tr/index.php/dernegimizin-duzenledigi-etkinlikler/ulusal-etkinlikler/>, last accessed 2021/05/12.
5. Sabuncu, M.: Türkiye’de makina teorisi ve dinamiği anabilim dalındaki eğitim ve araştırmada gelinen nokta. In: 16. Ulusal Makina Teorisi Sempozyumu, Erzurum, 2013, [http://makted.org.tr/wp-content/uploads/misc/Makina\\_Teorisi\\_ve\\_Dinamigi\\_Analiz.pdf](http://makted.org.tr/wp-content/uploads/misc/Makina_Teorisi_ve_Dinamigi_Analiz.pdf).
6. Makina Teorisi Derneği, Workshops and Summer/Winter Schools, <http://makted.org.tr/index.php/dernegimizin-duzenledigi-etkinlikler/calistaylar/?lang=en>, last accessed 2021/05/12.
7. Makina Teorisi Derneği, Sempozyum Bildiri Kitapları, <http://makted.org.tr/index.php/kaynaklar/bildiri-kitaplari>, last accessed 2021/05/12.
8. Özgören, K., Robot Kinematigi: Seri ve Paralel Manipulatörlerin Analitik ve Yarı-Analitik Yöntemlerle Konum ve Hız Analizleri, Makina Teorisi Derneği, Lecture Note Series, No: 1, Ankara (2015), <http://makted.org.tr/wp-content/uploads/kaynaklar/RobotKinematigi.pdf>
9. Özgören, K., Robot Manipulatörlerin Dinamiği ve Kontrolü, Makina Teorisi Derneği, Lecture Note Series, No: 2, Ankara (2016), [http://makted.org.tr/wp-content/uploads/kaynaklar/robot\\_manipulatorlerin\\_dinamigi\\_ve\\_kontrolu.pdf](http://makted.org.tr/wp-content/uploads/kaynaklar/robot_manipulatorlerin_dinamigi_ve_kontrolu.pdf)
10. Özgören, K., Mekanizmaların Hareket ve Kuvvet Analizi, Makina Teorisi Derneği, Lecture Note Series, No: 3, Ankara (2018), [http://makted.org.tr/wp-content/uploads/kaynaklar/Mekanizmalarin\\_Hareket\\_ve\\_Kuvvet\\_Analizi.pdf](http://makted.org.tr/wp-content/uploads/kaynaklar/Mekanizmalarin_Hareket_ve_Kuvvet_Analizi.pdf)

11. Makina Teorisi Derneđi, Sistem Dinamiđi ve Kontrol (2016), <http://makted.org.tr/index.php/kaynaklar/sistem-dinamigi-ve-kontrol/?lang=en>, last accessed 2021/05/12.
12. Makina Teorisi Derneđi, Lecture Notes, <http://makted.org.tr/index.php/kaynaklar/ders-notlari/?lang=en>, last accessed 2021/05/12.
13. Makina Teorisi Derneđi, Young Researcher Fund, <http://makted.org.tr/index.php/destekler/genc-arastirmaci-destegi/?lang=en>, last accessed 2021/05/12.
14. IFToMM, Young Delegates Program, [http://iftomm.net/index.php?option=com\\_content&view=article&id=34:young-delegates-program&catid=16&Itemid=147](http://iftomm.net/index.php?option=com_content&view=article&id=34:young-delegates-program&catid=16&Itemid=147), last accessed 2021/05/12.