



Contents lists available at ScienceDirect

Mechanism and Machine Theory

journal homepage: www.elsevier.com/locate/mechmachtheory

Short communication

Innovation challenges for Mechanism Design

Marco Ceccarelli

LARM: Laboratory of Robotics and Mechatronics, University of Cassino and South Latium, Cassino, Italy

ARTICLE INFO

Article history:

Received 24 October 2017

Revised 16 November 2017

Accepted 28 November 2017

Available online xxx

Keywords:

Mechanism and Machine Science

Design

Innovation

Mechanism Design

ABSTRACT

Professor Bernard Roth has been a pioneer in Robot Design as based on Mechanism and Machine Science and as in honour for his 85th birthday this paper wants to highlight how much Mechanism Design is influential in further developments of modern systems. In this paper challenges are discussed in terms of Innovation issues and Mechanism Design as they were and still are fundamental for technological transfer from Mechanism and Machine Science into novel successful mechanical designs of modern systems.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

Everywhere is asked for innovation in technological developments.

But what does innovation mean? What does innovation mean in MMS (Mechanism and Machine Science)?

In today modern society Innovation is understood as a multidisciplinary activity that is asked to produce technological developments with practical implementations for benefits both of their producers and users. In the last decades Science achievements have made possible new engineering developments (and vice versa!) in many fields with evolutions that have been faster than in the past. This continuous request/expectation has also produced a certain obsession for innovations and has produced even competition in developing solutions with characters that are believed to be fundamental for further developments even within well-structured frames. Aspects and trends of innovation multidisciplinary activity are today discussed and solicited from many viewpoints of the multidisciplinary content of Innovation and sometimes some aspects are overestimated with respect to other ones as due to specific experience and expertise of the innovation actors.

A rich literature is available even from each aspect of the innovation activity. References are not included in this paper as per its general character and as based on a personal experience of the author.

However, it is remarkable to note that also within the IFToMM community great attention has been devoted to the matter since its beginning in 1969 by indicating the IFToMM activity with Constitution prescriptions for searching new directions and research trends. For example, the work [1] is a short thoughtful discussion on what is required for innovation as coming from different actions but with a background of the author's expertise in MMS. Prof Bernard Roth (born on 28 May 1933) has dedicated most of his activity both in research and teaching looking on how to achieve and stimulate Innovation within the fields of mechanical engineering and his very recent book 'The achievement Habit', [2], is a handbook summary with autobiographical notes that is devoted to facilitating creativity independently of the level of expertise.

MMS achievements are developed in theoretical, numerical, and design works so that once implemented in engineering practice or in science applications they contribute to innovation or even they are innovation themselves. In this paper a

E-mail address: ceccarelli@unicas.it

<https://doi.org/10.1016/j.mechmachtheory.2017.11.026>

0094-114X/© 2017 Elsevier Ltd. All rights reserved.

Please cite this article as: M. Ceccarelli, Innovation challenges for Mechanism Design, Mechanism and Machine Theory (2017), <https://doi.org/10.1016/j.mechmachtheory.2017.11.026>

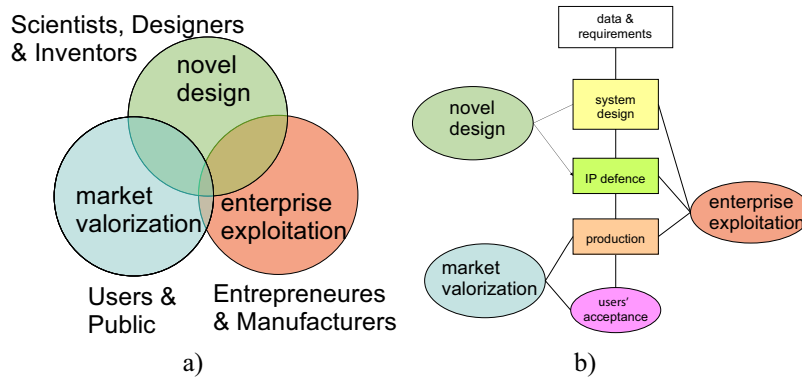


Fig. 1. Conceptual schemes for innovation: (a) for a general understanding; (b) in MMS areas.

synthetic presentation is attempted to clarify innovation mainly as related to technical aspects that are linked to MMS and IFToMM community.

2. Activities for innovation and challenges in MMS

In general, activity for innovation can be understood as a transfer of knowledge and corresponding solutions into market products for large public fruition. Fig. 1(a) summarizes the concept of innovation as related to multi-disciplinary activities by several actors. Innovation is achieved not only with novel ideas but mainly when the knowledge transfer reaches successfully the public world with users' acceptance. This complex of activities includes a variety of skills and when just one is weak or fails, the whole transfer process will fail. Innovation can be started when a technical idea or solution has potential contents of implementation. Thus, initiators of innovation are designers or scientists with engineering skills through their action as inventors, but in general the main exploiters are business experts and enterprise leaders, who develop and produce an innovation idea at proper levels for market valorisation and users' acceptance. It is to note that not only new solutions make innovation with new products, but very often it is the exploitation plan that produces innovation with new sale offers, like for example when a product reaches the market sales with no other competitors. Therefore, the success of innovation requires a full understanding of what can be transferred with enterprise perspectives into market sales toward properly solicited / identified users. Summarizing: Science and Technology are the fundamentals, but Economics and Administration are the motors, and Education and Publicity are final tools of Innovation. Education, likewise Publicity, can help potential users to understand the novelties and their practical features. Thus, University frames can be involved both in fundamentals and final tools when referring to technical contents. Indeed, Education and Formation are essential areas both for conceiving new ideas and preparing users to the acceptance of those new ideas.

Activities for innovation can be planned from different perspectives but requiring

- Technical novelty, which is the first motivation of innovation as coming from new ideas and solutions.
- Production feasibility, which is related to the practical feasibility of the novelty in term of products at an availability levels.
- Operation efficiency, which related to the practical usability with user-oriented products.
- Market exploitation, which is related to the features of a successful offer to a large public.
- Users' acceptance, which is related to the success with potential users.

Technical aspects are often emphasized as due to design creativity and ingenuity, and the defence of intellectual property is considered one of the main aspects of innovation value not only through patent release.

Understanding innovation can be considered fundamental for producing innovation with well aware plans and it can be helpful also for proper plans of the design developments of new ideas and systems.

All the above considerations for understanding innovation can be also explained as specifically referring to MMS when innovative ideas are related to machines and their operations, and users are identified not only in general users but even in stake-holders and technique developers/promoters. Thus, the general concepts in Fig. 1(a) can be reformulated as in Fig. 1(b) when they refer to the general modern concept of (service) machines that are aimed at helping or servicing human operators in work tasks or diary life.

In Fig. 1(b) the traditional engineering process is synthetically indicated in the block 'system design' of the diagram as the core technical activity for machine developments with technical procedures from the design up to the testing of prototypes by considering data and requirements. The multidisciplinary aspects for Innovation can be considered very influential for the design development of machines as coming from the many different aspects that involve also the enterprise exploitation and market valorisation as it is indicated by two corresponding lateral blocks. Market issues as well as Production constraints may suggest alternative or different solutions for design solutions and their performance by influencing the system final

Download English Version:

<https://daneshyari.com/en/article/7179136>

Download Persian Version:

<https://daneshyari.com/article/7179136>

[Daneshyari.com](https://daneshyari.com)