Factory of the Year Prize – A Benchmarking

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Abstract – **The first factory of the year prize was granted more than 60 years ago in the USA. Since then, a considerable number of countries joined this way and several best factory assessment methods and awards have been developed on national, regional, and international levels. These competitions give the possibility for benchmarking the companies. However, in the era of industry 4.0 maturity models have emerged for evaluating individual enterprises' readiness. These models support the companies in the individual strategy development. But the companies are always interested in their results and achievements compared to their competitors. But setting up a benchmark for a part of an industrial sector might be challenging. Therefore, combining the factory of the year evaluation concept with the maturity assessment might be advantageous. In the paper both of the approaches are analysed and it is discussed how they might be linked in a meaningful way.**

Keywords – factory of the year, benchmarking, industry 4.0, maturity model.

I. Introduction

Nowadays, a high rate of technological innovations in the area of ICT increasingly determines a country's economic development at macro level [12][14]. As the main driver behind economic performance in Central European countries, industrial companies benefit from advanced ICT and the resulting cyber-physical systems – referred to as Industry 4.0 – through the creation of more resilient, adaptable and efficient production processes [11]. Sustainable implementation of the Industry 4.0 paradigm requires recognition and analysis at a microeconomic level in private sector companies [10]. Therefore, Industry 4.0 predicts smart factories running horizontally and vertically integrated processes and elements along with every point of the local and global value chain [12].

At this time, various readiness and maturity models exist to evaluate Industry 4.0 maturity at the enterprise level. The main purpose of these models are i) the evaluation of the private companies regarding industry 4.0 readiness and ii) roadmap creation for achieving the formulated vision regarding digitization. These models are primarily used to select the best factory of a given country or region. Typically, a separate Factory of the Year (FoY) prize is established and the best companies are visited, evaluated and audited by an independent expert group. Usually for benchmarking purposes not the maturity models are applied but own questionnaires, visits and interviews make the evaluation possible. In this paper the FoY prize concept is the focus. Several prizes were analysed and compared. This paper aims to determine the drivers of these competitions and overview the most important prizes and winners worldwide. Last but not least the common potentials of the FoY prize and the maturity

model assessment is discussed.

The paper is structured as follows. First the motivation of the industrial companies is considered. After presenting the applied methodology an overview on the prizes and winners is given. Possibilities regarding future actions are discussed in the last capital.

II. MOTIVATION OF INDUSTRIAL COMPANIES

The benefits, the industrial companies might derive with the participation on FoY competitions are manifold [1][3]. The *short-term advantages* are straightforward: the physical form of the award – that might be placed on a shelf that is visible for both customers and employees – with possible money reward and the prompt feedback regarding the strengths and weaknesses of the company in the given field. These awards are structured in different categories, such as quality [4][5][6][7][8][9], green producer, industry 4.0, best supplier, etc. The participation in a given category can show and demonstrate the commitment of the company to a given topic (e.g., sustainability or digitization). The different forms of the media exposure (participation on different events, presence on different platforms, possibility for interview, involvement in videos, visibility in news and on various social platforms) are experienced in direct connection with the award-winning ceremony but may lead to *long-term benefits*. The performance measurements against benchmarks and recommendations formulated in the feedbacks from the evaluators might be helpful for the next strategic plan and contribute to permanent competitive advantages. The positive influence on employee recruiting, retention, and morale could be mentioned as an internal advantage for the company itself. The network access made possible with the participation on a FOY contest might result in joint activities with other prominent companies and institutions. These cooperations might lead to strategic partnerships. Figure 1 gives an overview on the benefits named by the organizers of the
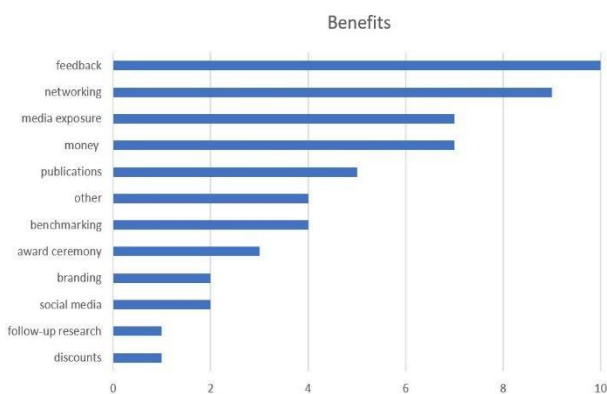
Figure 1. FoY award benefits

analyzed FoY prizes.

III. METHODOLOGY OF THE REVIEW

The review presented in the current paper is the result of a long-term collaboration between the authors. It is an important aspect that all of them are participating in the developments of various (FoY) competitions, many of them are also running and actively participating in the annual management of FoY prizes, e.g. with advertisement, methodology improvements, candidate evaluation, visits and validation of short-list companies, winners' decision, award ceremony, etc. Consequently, it is an important aspect that during the review of FoY prizes around the world the performers have wide knowledge and experiences that made the complete process more efficiently and resulted time and effort savings at the individual prizes of various countries.

The review of the FoY prizes was based mainly on country level. This approach seemed to be an efficient structuring because the majority of the FoY prizes are ordered to individual countries even if there are sometimes more of them in one country, e.g.:

- Germany: Industrie 4.0 Award, Industrie 4.0 Innovation Award, Manufacturing Excellence Award; or
- Brazil: AutoData Award, Brazil Tech Award, National Quality Award); or
- USA: AME Excellence Award, Colorado Manufacturing Award, Entrepreneur Of The Year.

Additionally, there is a small number of prizes that cover a wider range than a country, e.g.:

- European Union: European Advanced Manufacturing Award, European Business Awards, Industrial Excellence Award (European Award); or
- Global Lighthouse Network on a global level.

However, the authors also identified these wider prizes during the review.

As a basis to the analysis a viewpoint list was prepared as roughly listed:

- Country;
- Sub-categories, number of winners annually, cost of application;
- Industry sectors (some prizes are industry specific);
- The year of the first prize and the actual frequency;
- (Brand)name and weblink of the Factory of the Year award;
- Organizers: name, type (e.g., private, non-profit, university, journal, etc.) and weblink of the main background and supporting organizations;
- Advertisement channels: e.g., LinkedIn,
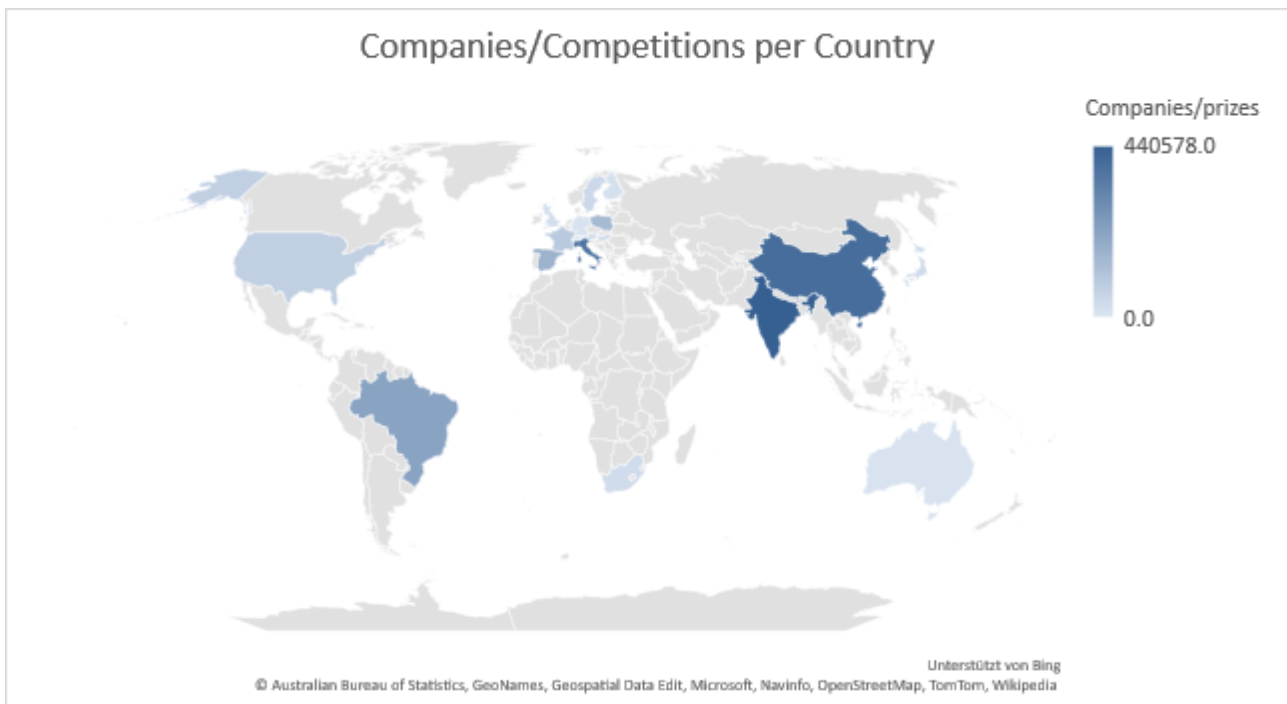
webpage, technical magazines, fairs, etc.;
- Added benefits for the winners (e.g., invitation to special forums, list of recommendations, "Club of Excellence");
- Typical steps for the competition (Nomination, agreement, self-evaluation, expert visit, fact sheets, etc.);
- Form (e.g., web-based, contract requirement, participation fee, etc.) and schedule of the nomination (e.g., typical deadline for applications, time for shortlist(s), timing of personal visits, time needed for the final decision, timing of the award ceremony, follow-up activities timing, etc.)

In order to comprehensive review the results, the winner companies from the last five years for each prize for each sub-categories were collected as name, sector/branch and their websites.

After the agreement on the aspects, the authors distributed a selected list of countries among them for their web-based search and analysis. The results were included in a shared, structured document. Finally, all of their attributes identified over 80 prizes and almost 400 winner companies. The numbers show that a wide and comprehensive review was performed.

IV. COMPARISON OF THE PRIZES

81 different prizes from 21 different countries / regions (national, international) were analyzed.

The prizes were listed and structured regarding several categories/aspects. First of all, the country was investigated. Also, the type of background organization of the prize was listed, whether it is a private company, a consulting firm, a research institute, etc. Further possible sub-categories of the different prizes and the frequency of the prize activity was listed. The existing prizes' industry sector was analysed to perform possible comparisons, etc. In the end, the complete application process of the single prizes was documented, where possible.

An overview on countries where prizes were analyzed is given on Figure 2. In total, 81 different prizes (12 Australia, 1 Austria, 8 Brazil, 6 Switzerland, 1 China, 21 Germany, 1 Spain, 1 Finland, 2 France, 2 Hungary, 1 India, 1 Italy, 2 Japan, 1 Poland, 1 South Africa, 1 Sweden, 5 United Kingdom, 10 United States, 3 Europe, 1 Global) were listed within this research. As it can be seen, most of such prizes are performed in Europe, especially in Germany.

Most of the prizes are performed by private industrial companies or consulting firms. Also, non-profit associations or organizations are assigning such prizes frequently. Further journals, publishers or universities are active in this field. Brazil seems to have many supplier awards, that are awarded by big manufacturing companies to their outstanding suppliers [2]. For example, the GM Annual Supplier of the Year Award.

Almost every prize is granted every year. Nevertheless, there are some prizes that are assigned in a minor frequency (e.g., every 2 years). The form of application is mostly via web / online application or special contracts.

The added benefits for the winners can either be

financial prizes (up to 50.000 €) or non-financial benefits such as:

- access to a "Club of Excellence" network; best practice sharing;
- detailed in-depth and customized feedback report outlining how to improve their business unit's operational performance; Social media coverage by the academic partners and online news;
- Follow-up research and case writing, in-house training of staff and executives alike;
- Commercial gifts.

V. COMPARISON OF THE WINNERS

In this chapter we compare the winners of the analyzed prizes. Some prizes only award companies from their own country, others from their own region, while some award applicants from all over the world. We looked at prizes mainly awarded winners from Europe, Asia, and North America (see Figure 2).

To determine the winners of a prize, committees focus on different evaluation criteria that can be grouped in mainly three sections. First, production-related criteria focus on the degree of novelty and innovation strength of the company or specific sectors. Within production, performance data, supply chain, process and product development, maintenance, implemented IT systems supporting the production, horizontal and vertical integration of IoT systems, level of automation and efficiency are assessed. Second, societal aspects were evaluated considering sustainability and ethics. With the link to production, the degree of a green factory is also assessed. Third, the company culture is assessed by the criteria of innovation, creativity, leadership, and customer focus. Between individual prices with focus on different domains, the weighting of the evaluation criteria

differs. Dependent on political and societal developments, the criteria also evolve over time. For instance, sustainable benefits and green factory are becoming more important in the assessment nowadays.

Given the criteria, winners can be determined. The sectors of the winners depend on the respective prizes. Generally, one can differentiate between engineering, electronics, and various such as pharmaceutical or financial industries focused prizes and therefore winners. As this paper is focused on Industry 4.0 awards, most winners come from the engineering category, spanning many different sectors, as seen in Fiure 3.

To get an overview over the awarded winners of selected prizes, see Figure 4. The winners of the *Germany Excellence in Production zum Werkzeugbau des Jahres"* between 2016 and 2021 are listed. On the left, the companies are listed, in the middle, the corresponding topic for the award is pointed out including the year on the right. To win the prize, an on-site audit is carried out and assessed by a jury of experts in politics, universities and economy. For instance, in 2021, *ZF Friedrichshafen AG* won with innovative sheet metal working tools, fixtures and testing equipment.

Figure 4: Germany Eccellence in Production Winners

In the same manner, the different award winners are listed for the other prizes mentioned in Chapter IV. With the focus on Europe, The Europe Industrial Excellence Award Winners were *Grifols*, *HelloFresh* or *Infineon* between 2019 and 2017. For advanced manufacturing, the award winner was *Provan* with innovative metal solutions in 2021.

VI. OPEN POTENTIALS, SUGGESTED ACTIONS

As a first experience, some countries manage their FoY prizes in their national language and do not have the English translation that made in come cases the search very difficult (but not unsolvable), so, the English translation of the national FoY prizes is a small administrative recommendation to these organizers in order to gain international visibility as well.

The survey resulted many novelties and conclusions, moreover it helped to appoint further open potentials and improvement possibilities for the future. Two fields are discussed here in more detail, namely, the idea of establishing a winner of winners prize and the feasibility of a global company benchmarking.

Regarding the *winner of the winners prize*, as introduced above FoY prizes are handled mainly on national level, however, there is some diversity whether it is a dedicated FoY prize or a sub-category in another competition. In such cases the methodology and the evaluation aspects may differ, and it is not easy to compare the winners or the evaluation results. However, the winner companies represent a high, excellent level that is worth showing internationally to serve with best-in-class examples. Additionally, it is a small additional effort for the winners but already to participation itself if a global representation for them. To introduce this second level of competition a global FoY prize could be established. It is proposed to invite only the winners and perform an evaluation/ranking among them. Consequently, this second round can be realized in the next year to the original FoY success with some smaller evaluation efforts, moreover it requires some harmonization and cooperation among the organizers of the individual prizes. Whether it has to be managed at first e.g., on the continent level or it can be realized as a direct, global novel prize is still an open question and an exciting development for the future, also which background organization can realize it (e.g., World Economic Forum).

The realization of a global winner of the winners FoY prize, would make it possible to benchmark companies with different sizes, from different industrial sectors, with various smart products. "Benchmarking" and "maturity" are often used interchangeably in the literature. Weiner [15] defines readiness as "the state of being both psychologically and behaviorally prepared to take action". Readiness assessment usually aims identification of risks, opportunities, potential challenges, and barriers to success [16]. Becker et al. [17] argue that maturity models and readiness assessment models also aim an objective evaluation of a company's position. I4.0 maturity models provide a guideline and enabling frameworks as a benchmark enriched with improvement steps. Assessing I4.0 maturity levels reveals a company's status and position in this roadmap with a protocol of progression through stages. It enables continuous improvements and support comparison of a company with the competitors. There are several Industry 4.0 readiness evaluation methods and maturity models in the literature [18][19][20]. Mittal et al. [18] investigate 15 different maturity models in terms of the method they use, the focus, and the gaps found in them. These models assess the Industry 4.0 maturity in different dimensions that contain questions or maturity items. The organization or company is evaluated based on these elements by choosing an appropriate level of scale, which contains in general four to ten levels. In terms of these dimensions, the most common ones are the following: strategy and organization, technology, IT, smart factory,

smart products, data utilization and employees. In some models, additional dimensions appear too, for example security policies [21], performance [22] and customers [23]. The product itself determines the relevant areas of maturity models. Companies usually offer not only the products themselves, but the related services as well. Smart products because of their embedded digital characteristics are able to fulfill complex functions, and they provide specific services. Industry 4.0 maturity is not always interpretable and measurable for all actors of the ecosystem according to the traditional definition of Industry 4.0, however, they are valuable contributors.

One of the biggest challenges of the current maturity models is to determine a benchmark, an average, that can be used as a baseline. This baseline might be concluded from an analysis where several companies are compared. The authors see two possibilities how such a benchmark could be chosen. One way would be the application of a centralized, homogenous questionary that requires little effort to fill in. Because of the small extent and low number of questions a huge number of companies might give input making the created baseline easy to determine. However, the results would reveal less information regarding the differences between the companies. Therefore, - as further research topic - a more complex process with normalization should be considered. In that way not just the differences regarding the industrial sector, country, culture or number of employees might be revealed but a more sophisticated assessment might be achieved. However, normalization might be difficult because of the following aspects:

- the favored ratio of applied robots and number of employees on the shop floor might be different for small and medium size enterprises and multinational companies,
- product or service complexity and portfolio might may have a huge diversity,
- the required technology diversification depends extremely on the industrial sector (food versus electric car),
- the conventional data and information systems (ERP, MES) could vary
- collaboration and cooperation possibilities might be influenced

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