

EUROPEAN MICROSYSTEM & MICRO-NANO TECHNOLOGY NETWORK

ΣMINENT

EUROPEAN B2B ACCELERATOR FOR M@NT SMES
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Generating M@NT SME Business Growth
Index



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1 Introduction

Some of the main objectives of the European initiative “ΣMINENT”, described as the European B2B accelerator for micro- and nanotechnology (M@NT) small and medium-sized enterprises (SMEs), are

- “strengthening the internal cooperation of regional associations, using potential synergy effects, copying successful activities, ...”
- “strengthening the external cooperation with relevant forums and branch organisations, ...”
- “representation on a European level of SMEs, operating in the micro and nano field”

In order to reach these objectives, it is crucial that ΣMINENT members are able to continuously measure, analyse and communicate the results of relevant activities and market developments. In other words, data – meaning statistics, regular survey or forecast results or ready indices - on the business activities of SMEs in the M@NT market segments in the European Union (EU) are required. An example for the latter would be a European M@NT SME Business Growth Index.

2 Objectives and Scope

In order to support the progress of the ΣMINENT initiative, this document has the following objectives:

1. Explanation of the strategic needs for and requirements of data series or indices on M@NT SMEs in Europe
2. Analysis and evaluation of the data availability and accessibility
3. Recommendation of a solution and next steps

This report answers the following questions:

- Why are indices on M@NT SMEs in Europe not only interesting and useful indicators but of critical importance for the ΣMINENT initiative?
- What are the requirements and constraints of collecting, processing and communicating the required data?
- Are the required data readily available and accessible? If not, why not?
- What shall ΣMINENT do in order to reach its objectives? What shall be the next steps?

The report does not answer the questions of which specific data should be chosen from which sources or which indices should be built and communicated by whom. These questions, which require a deeper analysis and an alignment of the members of ΣMINENT, are out of the scope of this document and need to be answered at a later stage

Due to the disappointing results of a market screening and expert interviews and the critical importance of the subject it is recommend to investigate the launch of a new European Commission (EC)-funded initiative. The purpose of this initiative would be the centralised and systematic collection, processing and dissemination of data on the target segments mentioned before.

The key objective of such an initiative would be the support of the business promotion and competitiveness of European M@NT SME industries and markets. The initiative should be realised in a phased approach, starting with regular standardised surveys and leading to the creation of one or two indicative indices, such as a M@NT SME Business Growth Index on the basis of aggregated revenue figures, and subsequently the creation and dissemination of a representative index set and related statistics. Parallel to this process, intensive lobbying for funding, promotion and support, especially for the official acceptance of classification codes, is required. It is conceivable that such an initiative, dealing with M@NT SMEs on a regular basis, integrates tasks of related national or EC-funded programmes focussing on, for example, the statistical measurement of innovation or competitiveness.

This report includes an explanation of the strategic objectives and fundamental requirements of such an initiative as well as the description and evaluation of the approach and results of a market screening. Furthermore, limiting factors which impede research on the target segments and limit the dissemination of representative, reliable and current data are being listed and explained. On the basis of this analysis, a conclusion is given and a recommendation is made.

3 Strategic Objectives and Requirements

When trying to communicate and substantiate the unquestionable success, attractiveness and increasing importance of M@NT applications, SMEs, industries and markets or analyse relevant developments in M@NT one always faces the same challenge: Where does one find representative, reliable and current data series concerning M@NT?

As already mentioned, the results of a market screening and expert interviews, which are described later in the paper, have been disappointing, confirming previous experiences and expectations: Neither the base data, which are required for the creation of indices, nor ready indices are available or accessible. For this reason, as indicated before, the launch of an initiative for the centralised and systematic data collection, processing and dissemination (including marketing and promotion) of M@NT-relevant information is proposed. The main strategic objectives of such an initiative – answering the question of why this information is so interesting and important – would be the following:

2.1 Strategic Objectives

- **Monitoring and Tracking of Relevant Developments of M@NT SME Markets**

The most basic and critical strategic objective of the initiative would be the monitoring and tracking of relevant developments in M@NT SME markets over time. The realisation of this objective, resulting in the dissemination of the required aggregated time series (e.g. one or more indices), is a mandatory prerequisite for all other strategic objectives. This information would help to make the M@NT SME markets more transparent, effectively supporting all existing market players as well as candidates, e.g. research firms, investors or developers, which want to learn more about M@NT and/or plan to enter these markets.

- **Communication and Marketing of the Success, Attractiveness and Increasing Relevance of M@NT SME Markets**

One or more time series, e.g. a business growth index, would greatly facilitate the communication and marketing of the success, attractiveness and increasing relevance of the M@NT SME markets. Representative, reliable and current data series on SMEs' business activities would back these arguments and make them more credible. When realised, results of this objective could be: Increased interest in M@NT of the media, business world, policy makers and funding organisations leading to a promotion and an acceleration of business. A comparable and successful example for the latter is the biotech sector.

- **Promotion of Business Activities and Competitiveness of European M@NT SMEs and Industries and Support of Capital Raising Efforts**

Even though already mentioned under the previous two points, the promotion of business activities of European M@NT SMEs is of such critical importance and one of the key reasons for this analysis and the proposed initiative that it is also listed separately. This objective might be reached through greater interest from investors seeking investment opportunities, governments looking for ways to promote companies and industries, potential SME customers looking for new solutions or partner firms seeking cooperation opportunities in the M@NT field. All of these parties need to be informed to get interested and supported through the provision of relevant data.

- **Development of a Controlling and Management Tool for the European Commission (and Other Policy Makers) Promoting and Funding M@NT**

Data series on M@NT SME industries and markets would actually represent an effective controlling and management tool for the European Commission and other policy makers promoting and funding M@NT. Only through these data series the responsible organisations can efficiently measure the results and effects of M@NT promotion and funding initiatives and policies and learn what is needed to promote business and raise competitiveness. On the basis of these measurements the organisations could either start new initiatives when deemed necessary or evaluate the effectiveness of past initiatives and policies, make possible adaptations to ongoing projects and plan accordingly in the future.

- **Support of Coordination and Promotion Efforts for M@NT Programmes of the European Commission and National Policy Makers**

Closely linked to the previous point, another strategic objective of the proposed initiative would be the support of coordination and promotion efforts for M@NT programmes of the European Commission and national policy makers. More information on the status and development of M@NT SME markets in form of data series, e.g. number of M@NT SMEs in certain regions, would allow these organisations to better set up and coordinate M@NT-relevant programmes. Moreover, European-wide efforts to promote M@NT through the dissemination of relevant data could be bundled and centralised, increasing overall efficiency and effectiveness.

- **Support of Fundamental Research on M@NT as well as M@NT Application Development and Marketing**

Statistical information on M@NT applications, industries and markets would support the fundamental research as well as the development and marketing of applications. On the basis of these data, M@NT SMEs could adapt their fundamental research and application development according to, for example, market demand or competition. As a result, M@NT SMEs could potentially improve research efficiency, ensure market-oriented application development and subsequently increase business volume.

2.2 Fundamental Requirements

What is needed? In order to be able to reach the strategic objectives listed above, several critical prerequisites have to be realised:

- **Data Quantity: Not One Index But an Index Set**

Clearly, when deciding to launch the proposed initiative, one needs to understand that the strategic objectives listed above cannot be accomplished through the creation, analysis and dissemination of just one index – this is the reason why an initiative and not just a project for the creation of one index is proposed.

A M@NT SME business growth index, for example, could be based on the regular measurement and aggregation of the weighted average of revenue changes of a sample population of European M@NT SMEs. Set at 100% at the start date of data collection and processing, one could track and analyse how the business of European M@NT SMEs is developing in form of an index.

Example:

$$\text{M@NT SME Business Growth Index} = \frac{\text{WAVG } (\Delta \text{ Revenues of Sample Population SMEs})^{t_{1+n}}}{\text{WAVG } (\Delta \text{ Revenues of Sample Population SMEs})^{t_0}} \times 100\%$$

with t_0 = Base year

However, this index would cover just one of many aspects required for an effective support of business activities of M@NT SMEs and the realisation of the strategic objectives. This index would, for example, not cover important factors such as the total number, regional distribution, average size, development stage, profitability, financing needs, internationalism or competitiveness of M@NT SMEs.

- **Data Quality: Representative, Reliable, Comparable and Current Data Series**

The data, whether it be survey results, statistics or indices, should ideally be representative, reliable, comparable and current.

Representative means that the data allow to measure and communicate specific developments in M@NT SME industries and markets, such as market volume and growth, number of players per segment or number and volume of venture capital/private equity investments in M@NT SMEs. It also means that the data are statistically significant, objective, rather than subjective, and comparable to other markets. Moreover, possible formulae need to be published and calculations (e.g. for an index) need to be reproducible by another party.

The data need to be reliable so that they are valid over a reasonably long time-horizon. This requires that they are statistically significant and that data gathering and processing rules including sample selection methods, inquiry procedures and calculations can be applied systematically in the same format over several years in all regions.

Comparable means that the calculation methods, if applicable, have been published so that an index could be rebuilt by an outsider and compared with other industries.

Considering the fast-changing structure and conditions of M@NT industries and markets, the data, raw or processed, have to be current so that they reflect changes in a timely manner.

- **Operations Ensuring Continuity and Top Quality of Systematic Data Gathering, Processing and Distribution**

In order to ensure the points described above, operations, regardless of which organisations would be responsible for and involved in this initiative, for data gathering, processing and distribution need to be in place and running. Members of this organisation or unit need to be highly knowledgeable about M@NT applications, industries and markets and have an extensive contact network in M@NT. Their main tasks would be to ensure the continuity of the systematic processes and top quality of the data to be communicated. In this context it is recommended to seek the cooperation with related firms, organisations and projects in order to leverage know-how, network contacts and resources. Moreover, this group would probably be responsible for the realisation of a data communication and marketing programme (see below).

- **Data Communication and Marketing Programme**

Data gathering, processing and distribution alone is not enough to reach the strategic objectives described above. A professional data communication and marketing programme answering questions such as when to deliver which data to whom at what cost or how to communicate findings through the media is of high priority.

- **Lobbying for European Commission/Government Support and Funding and Cooperation with Related Programmes and Projects**

In order to reach the strategic objectives and ensure the realisation of the described needs, support from the European Commission and, if applicable, national governments as well as funding is required. It has to be in the interest of policy makers promoting and funding M@NT initiatives and companies to not only initiate and support but also make frequent use of a centralised entity coordinating the tasks described above.

Support from these organisations is particularly needed for promoting the processed data and possible services, influencing institutions in adding M@NT as additional classification (e.g. EUROSTAT) in order to facilitate research and, if required, enacting new or adapting existing policies and regulations helping the cause. Furthermore, an organisation which is supported by or part of a promotion programme of the EC would have a better standing than a private firm, thus facilitating the realisation of the strategic objectives listed above and supporting cooperation efforts with related EC/government-funded initiatives, projects and organisations. The latter would allow to leverage know-how, networks and resources.

Funding from these organisations is needed because it cannot be expected that a professional private organisation will bear the costs of taking on the described tasks in the near future – ΣMINENT needs to give an impulse for improvements. Moreover, as indicated, some tasks and results of this initiative will only to a certain degree be commercially exploitable or profitable. Examples of the latter are the broad distribution of detailed data on M@NT SMEs at fair costs and general promotion of the M@NT industries.

4 Market Screening

The starting point of this analysis and report has been a market screening with the objective to find data series, i.e. statistics, regular survey or forecast results or indices, covering the business activities of M@NT SMEs in Europe and, for possible comparisons, in the USA.

4.1 Approach

Due to time constraints this market screening was intentionally not set up as a statistically significant research study but as a systematic trial-and-error search on the basis of own professional experiences covering the following sources of information: Internet, market studies and expert interviews. Further research, especially when searching and approaching potential partner firms and institutions for the proposed initiative, is recommended.

Using the Internet search tool Google searches were conducted on the terms microtechnology, microsystems and nanotechnology in combination with terms referring to data in general (e.g. index/indices, time series, statistics), specific data (e.g. market size, market volume, investments) and possible sources of the sought information (e.g. market analysis, analyst report, research report). In addition, web sites of well-known public and private providers of relevant information as well as sites of exchange-listed M@NT corporations and research firms known to report on the latter were accessed directly. As a result of these searches, in total, approximately 50 web sites were reviewed for general and specific information including data series. The reviewed profile types included (not ranked/sorted):

- EC/government-funded initiatives and programmes (e.g. CORDIS/ERA, National Nanotechnology Initiative)
- Universities and research institutes (e.g. ETH/Zürich, Fraunhofer Institut)
- N@MT corporations (e.g. Nanogate, Nanogen)
- National and international statistical offices (e.g. EUROSTAT, Bundesamt für Statistik)
- International patent offices (e.g. European Patent Office, Deutsches Patentamt)
- International government organisations and institutions (e.g. UN, OECD)
- Research firms and think tanks (e.g. Frost & Sullivan, Foresight Institute)
- Media companies (e.g. Scientific American, smalltimes)
- Financial information providers (e.g. Bloomberg Financial Markets, Thomson Financial)
- Investment banks (e.g. Morgan Stanley, Goldman Sachs)
- Venture capital/private equity associations (e.g. EVCA, SECA)

- VC/PE databases (e.g. VentureOne, Venture Economics)

In addition, available recognised and frequently cited research reports (e.g. Nexus Microsystems World Market Analysis) have been screened for relevant data series concerning M@NT. Moreover, interviews have been conducted with experts in M@NT and/or in the fields of research including data collection and processing of statistical base data and the creation of innovation and competitiveness indices of countries and companies (e.g. representatives of OECD and Swiss Federal Institute of Technology/KOF). The main purpose of these interviews was to inquire whether there any of the sought information readily available and, if not, how one could collect and process the required data.

4.2 Market Screening Results

The results of the market screening including expert interviews have confirmed previous experiences and expectations: There are hardly any to no relevant, reliable and current data series on European M@NT SMEs available or directly accessible. Some of the findings and concrete results of the market screening are the following:

- Studies on M@NT industries and markets, such as the Nexus Microsystems World Market Analysis or the Capital Stage Nanotechnologie Gesamtstudie, either include data series which cover selected parts of the target segments (e.g. microsystems) or varying results of surveys or forecasts, which can be considered starting points but do not fully meet the listed requirements.
- The selected databases on country, company and investment statistics (e.g. EUROSTATS, VentureOne) have not yet included M@NT as a separate search field, i.e. it is difficult to impossible to find useful data.
- Patent offices such as the European Patent Office allow to search for patents and companies. However, due to the multitude of applications, products and services and the questionable relevance of the number of patents this information is hardly helping the cause.
- Programmes and initiatives which measure and compare innovation (such as CORDIS/ERA) or competitiveness most often measure relatively general data on country level which are not relevant for an analysis of M@NT industries and markets. Programmes designed to measure these criteria at corporate level (e.g. ETH/KOF) are often focused on only one particular country but can, nevertheless, be considered interesting potential national partners of the proposed initiative.

- There are a number of interesting initiatives and projects which are related to the described subject. These are, as indicated before, innovation and competitiveness measurement programmes as well as M@NT-related projects. An example for the latter would be the new EC-funded nanoIndex-project of PHANTOMS and NEXUS which is promoting cooperation of micro- and nanotechnologists. Part of this project is the planned census of M@NT companies in Europe, which could be highly relevant for the creation of indices.
- There are too few exchange-listed M@NT corporations to create a peer group for possible data comparisons or the creation of indices.
- Thomson ISI tracks how often the term nanotechnology has been mentioned in research studies, papers and articles over time. This data series, which has strongly increased over the past years, could be used to interpret the general interest in nanotechnology, however, the meaningfulness of this information is questionable and it would not help to accomplish any of the listed strategic objectives.

To conclude, it is fair to assume that required base data are not yet accessible (see classification problematic) and indices fulfilling the described requirements do not yet exist. The problematic is clear: Not being able to identify a sufficient number of M@NT SMEs through database searches one lacks a statistically significant and representative sample population for the creation of an index, i.e. the complication is not so much the index calculation but the collection and processing of qualified base data. For this reason, an interim solution in form of an indicative index on the basis of surveys of, for example, member firms of M@NT associations, possibly in cooperation with international partner firms and institutions, is recommended.

Positive is the fact that there are a number of related initiatives and projects, which would be interesting cooperation partners for the leverage of know-how, network contacts and resources.

4.3 Limiting Factors and Challenges

What are the underlying reasons for the disappointing market screening results? When analysing and evaluating the availability of data series on SMEs in M@NT markets one needs to keep in mind a number of limiting factors and challenges. These factors have made it - and still make it - either difficult or commercially unattractive to produce meaningful and sound data series on M@NT and restrict the dissemination of the latter:

- **Early Development Stage of Industries and Markets**

Clearly, the micro- and nanotechnology industries and markets are still in an early development stage. This is shown, for example, by comparably few known specialised firms, many of them still conducting fundamental research, fast-changing market structures with high fluctuation rates, new developments and changing trends. As a result, there are only few and strongly varying forecasts of market volumes or growth rates and hardly any significant and reliable base data available.

- **High Complexity of Industries and Markets and Variety of Applications**

An analysis of the M@NT industries and markets yields highly complex structures with many different player profiles and an extraordinary large number of existing and possible applications. Naturally, these factors impede the categorisation of M@NT making it difficult to conduct systematic research and produce aggregated figures for selected search fields.

- **Lack of International Standards and Classifications**

When conducting research on micro- and nanotechnology it becomes apparent that there are few international standards and classifications, a fact which makes systematic international research difficult. For example, the definition and structure of market and product segments vary largely depending on the information source. When using databases for country and industry statistics (e.g. EUROSTAT), company statistics (e.g. SEC/NAICS EDGAR) or flow of investments (e.g. VentureOne) it is difficult to impossible to conduct segment searches on micro- and nanotechnology because there are no appropriate industry or product/service codes and classifications.

- **Lack of Transparency and Base Data**

As explained above, one of the key objectives of this initiative is to gather and process data focused on SMEs. Due to the small number of exchange-listed corporations in this field, low publication requirements (e.g. no quarterly reports and smaller scope of annual reports for private companies) and varying international standards (e.g. different data per legal entity) it is fairly difficult to aggregate specific information on SMEs in this field. As a result, the low transparency is one reason for the low number of relevant base data which can be used in order to reach the objectives described above.

- **Lack of Coordination and Sponsorship**

The research for this paper indicated that the government-sponsored initiatives promoting the micro- and nanotechnology industries in the EU as well in the USA have not yet started to coordinate or sponsor the coordination of a centralised industry research including the collection, processing, distribution and marketing of relevant market and company data. The organisations mentioned before are still very much focused on promoting the development of new applications but do not yet focus on the marketing of the latter. It can be assumed that reliable and relevant data significantly support marketing efforts.

- **Conflicts of Interest and Lack of Demand**

Clearly, private research companies specialised on the preparation and sale of studies and reports have limited budgets and resources and, for this reason, focus their research efforts according to costs and market demand. As a result, figures in purchasable analyst reports are often only based on few publicly available data or are taken from non-representative surveys or forecasts, i.e. these firms rarely gather or produce the required relevant and reliable time series. Moreover, there is a possible conflict of interest concerning the needs and objectives described above: Some data which are highly relevant for ΣMINENT or EU institutions, e.g. the measurement of effects of the EC nanotechnology funding, are not necessarily relevant for the potential buyer of a market study.

- **Lack of Awareness**

Having conducted the research for this study, it is fair to assume that several organisations and institutions are simply not yet aware of the importance and attractiveness of the micro- and nanotechnology markets and, for this reason, have not yet included these industries in relevant rankings or classification catalogues. As indicated above, one can also assume that national and international sponsors are only about to recognise the relevance of the sale and marketing of developed applications and, with it, the need for supporting information in form of indices and statistics.

5 Conclusion and Recommendation

In this paper it has been demonstrated that more information in form of data series on M@NT SMEs are not only highly attractive and useful for all involved parties but also of critical importance for the business promotion and competitiveness of European SMEs in the fields of M@NT, strengthening entire industries. Moreover, the results of the market screening and expert interviews indicate that the required information is not yet available or accessible. As a result of this analysis, it is strongly recommended to continue this investigation and consider the launch of the proposed initiative, ideally cooperating with related initiatives and projects. Concrete next steps should include the following:

- **Short-term Activities**

- Collection of requirements and constraints of a narrow indicative index (on the basis of surveys) set from ΣMINENT members (e.g. scope, frequency, resources)
- Planning of task, responsibilities and milestones
- Selection and approach of members of sample population (e.g. member firms of ΣMINENT associations)
- Kick-off of pilot project for publication of indices
- Dissemination and active marketing of data through media

- **Short- to Mid-term Activities**

- Alignment of tasks with related initiatives and ΣMINENT work streams dealing with, for example, the definition of classification standards in M@NT
- Preparation of concept and implementation blueprint for creation and maintenance of a representative index set
- Identification and approach of potential national and international initiative partner firms, organisations and projects (e.g. nanoIndex project, ETH/KOF, CORDIS/ERA) for possible leverage of know-how, contacts and resources
- Lobbying for EC/government support and application for funding of proposed initiative
- Start of initiative