

TECHADVANCE™ TECHNOLOGY ASSESSMENT HANDBOOK

*Handbook for the assessment of research
and technology including the introduction
of a model to assist in the process of
technology assessment,
TechAdvance™.*



TechAdvance™
Technology Assessment Tool

A product of

apprimo
innovation and market cultivation

Developed in cooperation with

Fachhochschule
Münster University of
Applied Sciences



Handbook mission

Addressed to all those involved in commercialisation (knowledge and technology transfer).

Successful new products and services provide significant profits and growth for firms as well as significant employment opportunities. However, the process of assessing research and technology projects is necessitated by the high failure rate, and resulting high cost, of technologies either prior to reaching the market or once in the market.

The TechAdvance™ Handbook is designed to assist in the assessment of research and technology projects for their commercialisation potential. Appropriate technology transfer is important to upgrade the quality of innovation and the quality of products and services to ensure stable and high quality knowledge transfer. Thus this handbook is intended to provide appropriate guidance for assessing a research or technology project, starting at an early-stage of the commercialisation process.

This handbook is also intended to propose some practical regulations, processes and structures to realise a high-quality standard of knowledge and technology transfer. The handbook has been designed to assess technologies in various stages of the process, from generating an “idea” to a later stage of offering a result to the market thus replicating a more realistic technology transfer (commercialisation) process.

A multi-dimensional validation process had been undertaken involving researchers and commercialisation managers; from different countries worldwide to ensure the tool’s practical relevance for daily use. This daily use consists of two areas of application:

1. Working Support Tool

To ensure the relevance of early-stage technology assessment, the quality of assessment, and the process should be reproducible. Thus it should be a fully recognised embodiment of what makes quality (has future market potential) in a detailed and validated format designed to identify those technologies with the greatest potential. Each case is different; the tool tries to anticipate and consider this. The TechAdvance™ method has achieved an assurance of consistency through the validation workshops. Users can have confidence that the method will indeed assist them in the assessment of technologies regardless of the nature of that technology.

2. Documentation and Reporting Management

There is a need in technology commercialisation to build a ‘responsibility system’ that is built upon a form of accountability: (1) responsibility for giving sufficient information and (2) responsibility for consequences of actions. For that purpose, appropriate documentation management of the assessment of technology and the technology transfer process is highly desirable. Initial rating quality is established based on limited information. As a result, it may be necessary to propose revised information at regular intervals as additional information of the product quality is gained and accumulated with improvements or revisions of specifications and test methods. We are confident that the TechAdvance™ model and assessment process will provide a useful tool to execute this.

I and the entire team from *apprimo* and the Science-to-Business Marketing Research Centre in Germany are proud to deliver this handbook. We feel honoured to be able to work with our development partners from around the world, from whom we have received substantial contributions for this handbook.

We offer this handbook for the sake of innovation and knowledge and technology transfer and interaction of academia and businesses. We would also be happy to receive feedback in order to improve the handbook and to find potential collaborators to develop the concept further.

Kind regards,



Prof. Dr. Thomas Baaken
Scientific Director, apprimo
Director, Science-to-Business Marketing Research Centre

Münster, Germany, 30. November 2010

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You can purchase an online version of this handbook at www.techadvance-online.com

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1 How to use the handbook

This handbook is designed in a way that provides the reader with an effective way of understanding the issues prevalent in technology assessment and also in presenting and applying the TechAdvance™ tool. Within the handbook, some chapters provide background information, others are required to be read to understand and correctly apply the TechAdvance™ tool. Thus, this chapter provides you with information on the purpose of each of the chapters in the handbook.

Chapter

2

Introduction and background (*provides a foundation for understanding technology assessment*)

Chapter two provides background information on innovation and its significance and positions commercialisation coming from research institutions in this wider context. The chapter underpins the importance of technology assessment within the commercialisation process by presenting benefits gained from conducting these assessments.

Chapter

3

Creating a model for technology assessment (*explains the development of the TechAdvance™ assessment tool*)

Chapter three details the development process of TechAdvance™ outlining the various research methods applied and the organisations / key people involved in the development of the tool with further information given on the key outcomes of the research steps. This chapter is not essential for utilising the TechAdvance™ tool, but provides information on how TechAdvance™ was developed. Thus, this information might be used within your organisation to give explanation for the application of the tool.

Chapter

4

Components of TechAdvance™ (*presents the key components and features of the TechAdvance™ tool*)

The chapter explains the components which form the basis of the TechAdvance™ tool. In contrast to the previous chapters, *chapter four* is crucial to correctly apply TechAdvance™ and should thus be read before the first implementation of the tool.

Chapter**5****Resources for using TechAdvance™**

Having introduced the key components of TechAdvance™ in the previous chapter, *chapter five* provides the resources that will assist in assessing technology using the TechAdvance™ tool. Within the chapter, a process model of how to use the tool, the weightings needed to calculate the assessment and an explanation of the TechAdvance™ criteria are provided. Just as in chapter four, this chapter is relevant to correctly apply TechAdvance™.

Chapter**6****Example of TechAdvance™** (*provides an example project that has been assessed using TechAdvance™*)

Chapter six illustrates how to use the TechAdvance™ workbook using a practical example, thus giving you a reference for the completion of the assessment of your projects.

Chapter**7****The TechAdvance™ assessment**

With the components, features and process of TechAdvance™ having been explained in the previous three chapters, *chapter seven* contains the actual TechAdvance™ assessment worksheets, where research and technology projects can be assessed.

Please note, if you want to conduct multiple assessments, you should not complete the assessment in the pages of the actual handbook. Rather use this chapter as a template to be copied and handed out to those planning to conduct an assessment.

Chapter**8****Explaining TechAdvance™ Online**

Chapter eight presents TechAdvance™ Online - a web-based assessment tool using the TechAdvance™ method. The online tool has been developed for those regularly conducting technology assessments, significantly reducing the calculation time and eliminating the possibility of errors in the user's calculations. Some additional advantages of the online tool are that the user has the option to change its current projects and to create reports of those projects.

Quick guide to TechAdvance™

The following table summarises the chapter explanations above and aims to guide your reading procedure of the handbook.

		Information informing the TechAdvance™ assessment process	Required reading to undertake the TechAdvance™ assessment
Chapter 2	Introduction and background	★	
Chapter 3	Creating a model for technology assessment	★	
Chapter 4	Components of TechAdvance™		★
Chapter 5	Resources for using TechAdvance™		★
Chapter 6	Example of TechAdvance™		★
Chapter 7	TechAdvance™ assessment		★
Chapter 8	TechAdvance™ Online	★	

Legend

★ - indicates the type of information provided within the chapter

'Information informing the TechAdvance™ assessment process' - refers to information that may be more valuable to understand research and technology evaluation in a general sense or is background information to the TechAdvance™ method.

'Required reading to undertake the TechAdvance™ assessment' – refers to information that is essential reading for understanding and undertaking the TechAdvance™ method.

Why TechAdvance™?

The TechAdvance™ Handbook was developed in order to align research and technology projects with the market early and to encourage consideration of issues likely to confront the project as early as possible in the process of commercialisation. The mind-set for this approach is that the earlier a research and technology project can find or align itself with a market, the greater the likelihood that it can solve a market need and therefore be more likely to be successful in the market.

The TechAdvance™ Handbook is designed to assist in the assessment of research and technology projects for their commercialisation potential. Successful new products and services have the potential to provide significant profits and growth opportunities for firms, however, many technologies with the potential to deliver these benefits, fail to make it to market. The early assessment of technologies as well as their alignment with the market early in their development is a key way to increase the chances of technologies becoming successful products and services. A further impetus to proactively apply assessment processes such as this is the decline in funding available from the government for research. This situation means that research and technology projects have a greater incentive to be market aligned in order to maximise their chances of success.

The method will help technology managers, commercialisation officers, business development managers, venture capitalists and others involved in the commercialisation process in the assessment of research and technology projects.

Features of the TechAdvance™ Tool

Within this handbook you will be introduced to the TechAdvance™ tool which provides the following key features:

(1) *Easy to understand and implement*

Feedback received from the validation workshops was that it is important to keep the tool easy to understand and use, so that is how the tool has been designed. The structuring of the criteria in the three dimensions; market attractiveness, technology potential and people, has been intentionally made straightforward.

(2) *Custom-designed for research institutions*

While idea assessment tools are generally designed for use by firms, TechAdvance™ was specifically developed to meet the needs of universities and other research institutions in the assessment of their research and technology projects.

(3) *Research-based assessment*

As opposed to other *ad hoc* technology assessment tools, TechAdvance™ is based on empirically researched criteria and criteria weightings coming from a wide selection of professionals in the industry and has been validated through a series of workshops.

(4) *Suitable for use in a diversity of organisations*

Rather than being a conceptual model developed by a single organisation, TechAdvance™ has been developed with and validated by various research institutions and private businesses incorporating world's-best practice.

(5) Convenient handling

The structure of this handbook makes it uncomplicated and fast to assess a project.

(6) Designed for use by multiple target groups

The model was validated to be useful across three different levels within a research organisation specialising in research and development:

- For an agency or department
- For a business developer or person responsible for technology transfer
- For a researcher / inventor

Outcomes that can be achieved using the TechAdvance™ Handbook

Based on these key features, TechAdvance™ provides the following primary outcomes to its users:

(1) Designed as a means of assessing of research projects (Assessing)

TechAdvance™ provides a detailed assessment of the commercialisation potential of research and technology projects. Users benefit from researched-based criteria and criteria weightings, an extensive validation process as well as the clear three-dimensional structure of the criteria.

(2) Designed as a means for the identification of the commercialisation potential of a portfolio of research / technology projects (Structuring)

TechAdvance™ allows for the ranking of assessed technologies and research projects in a portfolio. Users benefit from the *TrainTrack Resource Allocation Method* to assist in the prioritisation of resources across a portfolio of projects based upon their commercial potential.

(3) Designed as a guide to develop and improve the project (Developing)

TechAdvance™ provides target-oriented development of technologies and research projects with high commercialisation potential. Users benefit from the identification of areas for improvement or potential issues in the development of the research or technology project.

(4) Designed as a checklist to highlight unforeseen project issues (Risk Management)

Users benefit from the identification of issues which have to be addressed in the commercialisation process of technologies and research projects (feature 4) which reduces the risk surrounding the project.

2 Introduction and background

Research context

In today's economic setting, innovation has become central in terms of wealth and job creation as well as economic growth and competitiveness (Dorf and Worthington, 1987; Maes, 2003; European Commission, 2006). Thereby, the reasons for the increased significance of innovation are multifaceted, including steadily shorter product life cycles¹, the progression of globalisation, continuously faster technological development, and ever-changing customer needs (Gummeson, 2002; Santoro and Chakrabarti, 2002; Cooper, 2000). Resulting in an intensification of the competitive landscape (Siguaw, 2003), these changes have placed significant pressure on organisations across all industries and country borders.

Today, innovation and new product development is seen as a company's most important driver to gain and maintain sustainable competitive advantages in the new knowledge economy (Tucker, 2002; IBM, 2006). A study done by Cheskin and Fitch (2003) outlines that nearly half of the US CEOs rated innovation as "very critical" to their company's future success. Another study undertaken by Arthur D. Little (2005) shows that the enhancement of innovation abilities is seen as the number one driver of European companies' profitability and growth. Hence, businesses tend to open their research and innovation processes (Chesbrough, 2006) with the purpose of raising their innovation potential by accessing external resources (Howard, 2005). This, in turn, shows that not only business organisations but also universities (and other research institutions) as well as intermediaries (such as technology transfer offices) involved in the commercialisation process are affected by the changing environment. Universities are not just driven by the public view that they have a large responsibility and specific capability to support economic issues (Australian Centre for Innovation, 2002). Rather, they are forced to commercialise their research competencies, capacities and results due to significant cuts in state support (Baaken, 1999).

The number of university-industry relationships and technology transfer projects in general have significantly increased in recent times (e.g. Poyago-Theotoky et al., 2002) and provide an enormous potential to foster innovation, leading to the need to pay particular attention to the management of technology commercialisation processes.

¹ According to a German study product life cycles have decreased by 400 percent over the last 50 years. Compare Cooper (2000).

Problem definition and significance

New products and services successfully reaching the market provide significant profits and growth for firms as well as significant employment opportunities (Cooper, 1993). However, many innovation projects fail which can result in substantial losses of time, money, reputation, and market position (Heslop, McGregor, and Griffith, 2001). According to Cooper (2000) an estimated 46 per cent of resources are allocated to the conception, development and launch of products which never reach the market or fail after rollout. In further publications, Cooper (2002; 2003) outlines that just one out of seven innovation concepts becomes a winner and that 44 per cent of new product development projects do not achieve their profit targets.

A wide-ranging consensus is reached on the fact that managing innovation has a positive influence on the later market success. While empirical research found a positive correlation between the usage of practices and new product development success (e.g. Tatikonda and Rosenthal, 2000), considerable usage of these practices is not yet reached (Farris et. al., 2003)². Many organisations – primary *small and medium-sized enterprises* – still face a lack of practicable processes and models making the innovation journey more efficient and effective (Dooley and O’Sullivan, 2003).

One major component of managing innovation processes is picking the winners from the wide range of opportunities to further develop and transfer them (Heslop, McGregor and Griffith, 2001). In other words, an evaluation system is needed to assist the: (1) identification of potential projects to be taken to market, (2) development and resource allocation, and (3) pricing of technology research, in order to provide more innovation projects that successfully go to market and succeed when they get there.

(1) Identification of potential projects to be taken to market

Successful technology commercialisation begins with systematically identifying those appropriate technologies to be transferred from the wide range of projects that organisations have at various stages in the commercialisation process. The difficult task of taking a technology to market is further exasperated by the fact that technology managers have few reliable tools to assist in the identification of technologies that are likely to be successful in the commercialisation process (Heslop, McGregor, and Griffith, 2001).

(2) Project development and resource allocation

Organisations have limited resources to develop innovation projects and need, therefore, an assessment tool in order to prioritise these projects for further development and to allocate resources to them. Due to the fact that the decision whether or not a project will be further commercialised should not be made isolated but in consideration of the total project

² Primary large corporations use existing process descriptions, analysis models and business planning in general with less usage found in smaller organisations

portfolio, the assessment tool is required to cover projects from different areas (e.g. biotechnology, engineering or construction) in order to provide straightforward comparability.

(3) *Pricing of technology research*

Innovation managers have a strong need to estimate the technology's current value in order to support decisions on the future line of action (e.g. *intellectual property* [IP] sale or licensing). Hence, assessment tools – as a strong indicator for pricing³ – are required to include criteria important for pricing, such as the three C's of pricing: cost, competition, and customers (Mohr, 2001).

This handbook aims to introduce the TechAdvance™ technology assessment tool to contribute to the difficult task of managing technological innovation and raise the market success. Due to the fact that many different organisations facilitating knowledge and technology transfer between public research and industry aim to develop and improve the likely success of commercialisation projects, the assessment model presented in this handbook is of particular interest for all parties involved along the “knowledge supply chain”. This includes producers of new knowledge/technologies, mediating institutions as well as demanding business organisations. More precisely, these are: technology-oriented companies, universities, *public research organisations* (PROs), *technology transfer offices* (TTOs), technology commercialisation consultants, *high educational institutes* (HEIs), technological institutes, technological and technical centres, IP advisors, business angel groups, venture capitalists, science parks and clusters, incubators regional development agencies and, state/national agencies and networks that facilitate knowledge and technology transfer between public research and industry.

³ It has to be noted that most technology assessment tools are not designed to regulate/replace pricing but simply act as an indicator.

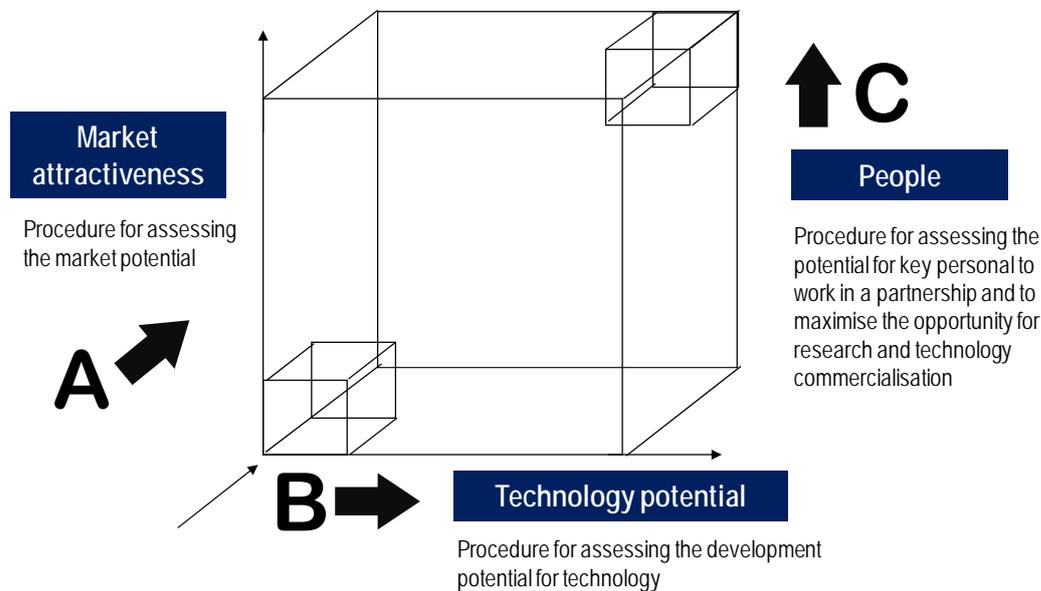
[Chapter 3 is not part of this trial read]

4 Components of TechAdvance™

This chapter introduces the core components of TechAdvance™ and aims to generate a basic understanding of the tool.

Component 1: Three-dimensional model

Providing a clear and easy to understand structure, TechAdvance™ uses a three-dimensional model integrating primary dimensions “Market Attractiveness”, “Technology Potential” and “People”. Positioning assessed technologies in a portfolio using the three dimensions also contributes to the comparability of projects and the target-oriented resource allocation. The following model describes the three dimensions.



*TechAdvance™, a three-dimensional technology assessment model
Source: Adapted from Baaken (1989), Münster University of Applied Sciences*

Component 2: Assessment criteria

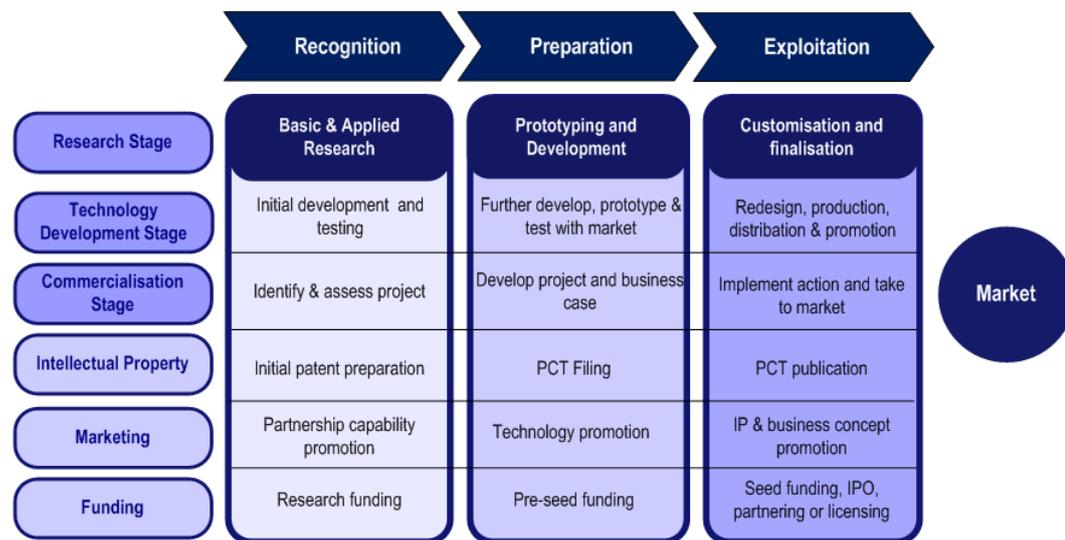
TechAdvance™ uses a total set of 43 criteria to assess technologies and research projects. Adapted from the *Clover Leaf Model* developed in North America and validated through workshops and a quantitative survey, the criteria target the most important factors for developing the optimal commercialisation project. The 43 assessment criteria have been organised in the three dimensions described in the model above: “Market Attractiveness”, “Technology Potential” and “People”. Structuring the criteria in these three dimensions adds a macro-perspective to the tool allowing users to quickly review in which of the three dimensions a project might encounter problems. The criteria and their explanations can be found in chapter 5.

Component 3: Organisational-specific criteria

Developed as a flexible system that is adaptable to the needs of the organisational needs, TechAdvance™ allows users to add further criteria to the set of 43 researched criteria. In addition to the three dimensions “Market Attractiveness”, “Technology Potential” and “People”, “*Organisational-Specific Criteria*” has been added to provide a more customised assessment. Some criteria that could be included as ‘Organisational-Specific Criteria’, as identified in the validation workshops, can be found in Chapter 5 in ‘criteria explanation table’.

Component 4: Stage of development

During the validation of the TechAdvance™ tool it was found that the stage of the development (of the research or technology project) influenced the expectations for the projects’ commercialisation potential. As such, following a review of literature, and in order to keep the model easy to understand, three stages in technology assessment were established as follows: (1) “Opportunity Recognition”, (2) “Opportunity Preparation” and (3) “Opportunity Exploitation”. Each of these stages were characterised by a number of aspects of the commercialisation process and highlights the characteristics of each stage. The three stages are shown below.



Legend

PCT – Patent Cooperation Treaty
 IP – Intellectual Property
 IPO – Initial Public Offering

The Commercialisation Process

Source: Davey (2008)

The importance of the *stage of development* in technology evaluation was validated in research conducted within the frame of creating TechAdvance™.

Component 5: Criteria weightings

The criteria used in TechAdvance™ are weighted to give greater importance to the most important criteria in creating a commercial research or technology project. Further the weightings for each of the criteria also change depending on the respective stage of development. Consequently, taking into account that the importance of the identified assessment criteria (component 2) differs depending on the stage of development (component 4), TechAdvance™ uses specific criteria weightings for each stage of development. Overall, 108 criteria weightings (36 criteria multiplied with 3 stages; 7 criteria are yes/no questions and are not weighted) have been researched through a quantitative questionnaire described in chapter 3.

The result is that the most important criteria are given greater influence at each of the different stages of research and technology commercialisation/development.

As an example, market-related factors are often considered of less importance in the first “Opportunity Recognition” phase since the application of the technology might not be clear at this stage. People-related criteria, on the other hand, are of higher importance because projects need specific skills and knowledge to further develop the technology and champion the project in general. The importance of these criteria, however, changes during the commercialisation phase so that, for example, market-related criteria become the most important in the final stage.

[Information on further components, and the
chapter 5 to 9 are not part of this trial read]

Factsheet *apprimo*

FOCUS	Organisation enhancement through innovation and market cultivation
SHORT PROFILE	<p><i>apprimo</i>...</p> <ul style="list-style-type: none"> • is a spin-off from the Science-to-Business Marketing Research Centre at Münster University of Applied Sciences, successfully operating in the area of science and business since 2002. • supports organisations in stimulating growth through effective and efficient innovation management and consistent market orientation • supports universities and research institutions with the optimisation of technology transfer and cooperation between science and business • is equipped with diverse and extensive skills and experience in both science and business • is internationally orientated, multilingual, and has shareholders and employees which have market experience in 27 countries • has proven and validated products and methods as well as successful project experience • consists of analysts, consultants and implementation managers who have successfully completed in excess of 100 projects
COMPETENCIES	<p><i>apprimo</i> combines competencies in the fields of innovation and marketing as well as in the following related areas:</p> <ul style="list-style-type: none"> • Commercialisation • Idea management • Technology assessment & development • Science-to-Business Marketing • Technology transfer • Technology marketing • B2B / B2C marketing • Entrepreneurship
PRODUCTS & SERVICES	<ul style="list-style-type: none"> • Consulting • Market research • Workshops • TechAdvance™
CUSTOMER BENEFITS	<p><i>apprimo</i> offers its customers tailor-made solutions through...</p> <ul style="list-style-type: none"> • years of experience • the integration of the latest research findings and methods from science • scientifically accurate, but practically usable market research findings • a focus on customer needs, target and results in the implementation of projects • target-oriented grouping of competencies within the project team and through the integration of external partners
CUSTOMERS	<ul style="list-style-type: none"> • Universities and research institutions • Medium and large sized companies • Start-ups
EXECUTIVE BOARD	Thorsten Kliewe, Todd Davey, Daniel Pomplun
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