universität wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

"IT-based decision support tools in general management – supplies and demands of mid-level managers in Germany, Austria and the CEE "

verfasst von / submitted by

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angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien, August 2020 / Vienna, August 2020

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	A 066 915
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Betriebswirtschaft
Betreut von / Supervisor:	Univ.-Prof. Dipl.-Chem. Dr. Markus Georg Reitzig, MBR

ACKNOWLEDGEMENTS

First and foremost, I would like to express my sincerest gratitude to Professor Markus Reitzig for his support, his patience, his trust, and, most importantly, for being able to maintain the equilibrium between rigor and constant fairness.

Likewise, my gratefulness is also directed to the entire chair of strategic Management, especially to Tomaš Lego for his steady helpfulness and Sandra Perger for her everlasting kindness, her diligent efforts and her unfailing professionality of handling all requests throughout the last years.

Nevertheless, I thank my family, my partner, and friends for their support, their ability to always find the right words, their understanding, and respect.

You are greatly valued.

ABSTRACT

With well-established frameworks developed by the end of the last century, DSS is still a highly relevant field, not only in research, but also in practice. Topics such as digital transformation or business intelligence are part of a managers' standard vocabulary. This research aims to identify bottlenecks in both supply and demand of DSS tools for General Middle Managers in Austria, Germany and the CEE. However, most importantly, mismatches between supply and demand will be evaluated.

To do so, a framework to structure all decisions performed by GMM has been set up, as well as a classification scheme to compare and evaluate DSS applications. It has been found that all DSS tools unite data, analytics and automation capabilities whereof each can exist on a continuum from low to high. By analyzing 222 vendors and their offering, a thorough representative cross-section of the market regarding all three components was established. For demand evaluation, an online survey has been executed with 103 GMMS.

Results show a strong shift towards integrative, holistic tools that cover broad range of processes and decisions. Especially for generic management decision, demand outweigh supply considerably. Throughout most functional areas, supply equals demand, however with minor differences between different departments. Results on the one hand help vendors understand GMM demands in order to identify possible gaps as. On the other hand, they help managers understand technical concepts, market availability and market average by shedding light on concepts, capabilities and demarcations. Findings underline the importance of integrative data management and comprehensive information collection in order to be able to recognize realistic connections and get holistic insights.

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ABBREVIATIONS

AI	Artificial Intelligence
B2B	Business to Business
B2C	Business to Customer
BA	Business Analytics
BI	Business Intelligence
CEC	Customer engagement
CEE	Central and Eastern Europe
CIO	Chief Information Officer
CMP	Content Marketing Platform
CRM	Customer Relationship Management
CX	Customer Experience
DACH	German Speaking Region (Germany, Austria, Switzerland)
DAM	Digital Asset Management
DS	Decision Support
DSS	Decision support system
ETL	Extraction, Transformation and Loading
FP&A	Financial Planning & Analytics
GM	General Manager
GMM	General Middle Manager
GDSS	Generic Decision Support
HCM	Human Capital Management
HR	Human Resources
HRIS	Human Resource Information System
HRMS	Human Resource Management System
IS	Information System
IT	Information Technology
KPI	Key performance indicator
LMS	Learning Management System
MA	Marketing Automation
MIS	Management Information System
ML	Machine Learning
MM	Middle Management
MMs	Middle Managers
MMH	Multichannel Marketing Hub
MSS	Marketing Software Suite
NLP	Natural Language Processing
OLAP	On-Line Analytical Processing
OLTP	On-Line Transactional Processing
SAAS	Software-as-a-service
SFA	Sales Force Automation
TMS	Talent Management System
WCM	Web Content Management
WEM	Workforce Engagement Management
WFM	Workforce Management

1. INTRODUCTION

Every day, business managers make decisions that affect the organization as a whole, its stakeholders, or other individuals linked with it in a variety of ways. Decision science in this context tries to evaluate how decisions can be made so that risk is reduced to a minimum, and simultaneously, the value of the decision outcome is maximized (Garcia-Perez et al., 2019).

Decision making itself can be defined as “the process of making choices by identifying a decision, gathering information, and assessing alternative resolutions” (Garcia-Perez et al., 2019), with risk being an inescapable part of every decision (Buchanan and O Connell, 2006). Even though, as Frank Knight distinguished in 1921, calculable risk and erratic uncertainty cannot be equated, they often go hand in hand (Buchanan and O Connell, 2006). Moreover, seldom is managerial decision-making as essential and trendsetting for a company as in uncertain times. Especially today, in times of a global, unpredicted pandemic that hit the world and business leaders surprisingly hard, the conditions in which businesses are operating are volatile and uncertain. 'Business as usual' no longer exists, and the rules of the game are being transformed on a daily basis.

Most decisions were always and still are based on instinct and gut feeling (Buchanan and O Connell, 2006). Nevertheless, managerial intuition often fails; for example, if conventional views of decision quality are wrong, data is wrongfully interpreted or subject to human bias or if confidence overweighs competence (Accenture Strategy, 2016). Research into risk and organizational behavior tries to help managers make better decisions and, consequently, achieve better outcomes (Buchanan and O Connell, 2006).

Throughout time, technological advancements have allowed a shift from intuitive decision making and have allowed to base decisions on a foundation of underlying information and data and to include analytical thinking. When computers first came into practice and started to rise in importance back in the 1980s, the prerequisite for managerial use was described to be an adequate software adapted to the management thinking process. The increasing user-friendliness of modern systems allows this more flexible approach, which is more fitting to managerial requirements. This evolvement started to close an existing gap: managers were no longer required to consult with the IT department; the data relevant for the decision

was provided by the software application directly. This gap is of interest to researchers until today. (Computerwoche, 1982).

Back then, the idea of a decision support tool was born. As a result, corporations today try to have as many insights as possible, methods such as scenario planning, business forecasting or others help build a foundation to base business decisions on (Buchanan and O Connell, 2006).

So, ever since the first appearance of Decision Support (DSS) research in the 1960s, the advancement of new technologies has assisted in the continuous expansion of the field even though the research focus has shifted (Arnott and Pervan, 2014). In the 1990s, it was suspected that the task of the middle manager (MM) could be entirely fulfilled by methods such as advanced computer technologies. The assumption was that if top and first-level managers are enabled to communicate directly, the position and role of a MM would become redundant. (Brubakk and Wilkinson, 1996). Throughout time, more and more new strands of research have emerged from theoretical foundations, such as data warehousing, Business Intelligence (BI), and Business Analytics (BA), which, however, further supported the continuous open-endedness of the field rather than its abundance. Because alongside its theoretical evolvement, the practical value remains substantial, managerial relevance is expected to show even greater pertinence in the upcoming years. (Arnott and Pervan, 2014).

To put it in a nutshell, DSS is still a relevant field of research, basing on well-established frameworks developed by the end of the last century. This thesis aims to shed light on DSS supply and demand bottlenecks for Mid-Level General Managers in Germany, Austria, and the CEE. In order to do so, a contextual profile of managerial DSS use and demand has been created.

This thesis goes on to outline some theoretical foundations of DSS theory, as well as mid-level management and general management, before describing a contextual framework of decisions to be made in General Middle Management positions. The central part of this research targets a thorough market analysis of DSS tool supply and demand throughout the different tool categories relevant for General Middle Management decisions. To map the supply with actual manager demand, a survey was conducted with 103

General Middle managers. Finally, results to analyze differences between supply and demand will be discussed. Findings will add to understand further how managers use the current system offerings and will make suggestions to fill in possible gaps on either supply or demand side.

2. THEORETICAL FOUNDATIONS

2.1. ORIGINS AND EVOLUTION OF DSS THEORY

With his work in the 1960s, late Nobel laureate Herbert A. Simon began laying the foundational framework for Management Information Systems (MIS), which later developed into DSS theory (Shim et al., 2002) and which despite little to absent scientific evidence, has attained axiomatic status in management research and practice until today (Arnott and Pervan, 2014). In his work, he conceptualized both a model for making management decisions and the different types those decisions could be attributed to (Alyoubi, 2015). The first, being the most cited conceptualization of describing different decision-making phases (Arnott and Pervan, 2014), divides the decision-making process into three distinct stages: *intelligence, design,* and *choice.* Intelligence includes the environment scan to identify problems initially, while design involves the development of alternatives, and lastly, choice consists of analyzing the alternatives developed in the previous phase and the selection of the ideal alternative for implementation. (Simon, 1960).

Later, researchers added *implementation* as a separate fourth stage of the process (Phillips-Wren and Jain, 2007). In terms of decision types, Simon contextualizes that decision problems can exist from *programmed*, well-structured, repetitive and easily solved to *non-programmed*, meaning new, ill-structured or hard to solve decisions (Simon, 1960).

One of the main aspects of Simon's theory is the bounded rationality theorem: Decision-makers could theoretically make rational decisions if sufficient data were available. However, human decision-makers and thus, their decision outcomes are compromised by incomplete information, inadequate mental processing ability, complex circumstances, or limited time (e.g. Buchanan and O Connell, 2006, Hosack et al., 2012), a limitation caused by human nature, which researches have tried to overcome up until today (Hosack et al., 2012). Not being able to reach this ideal solution, a decision-maker is willing to accept a

solution that is 'satisfying' (Simon, 1960), meaning merely good enough (Hosack et al., 2012). As a result, the MIS as an objective, more rational computer system can process the data much faster. It also might assist in decision making to overcome the downsides of bounded rationality by providing managers with structured, periodic reports, mainly containing financial and accounting information (Power, 2007).

Gorry and Scott Morton (1989) were the first to introduce and define a concept (e.g. Power, 2008, Shim et al., 2002), as well as the term DSS (Hosack et al., 2012) and thus distinguished it from MIS (Alyoubi, 2015) by combining Simon's decision types and Anthony's categories of management activities, consisting of *strategic planning*, targeting overall strategic executive decisions, *management control*, usually targeting tactical decisions made in middle management, and *operational control*, targeting operational tasks performed by first-line supervisors (Gorry and Scott Morton, 1971, Shim et al., 2002). Other than previously defined, decision problems, or more precisely the decision context were no longer split into programmed or unprogrammed problems but included *unstructured*, *semi-structured* or *structured* problems, characterized by the degree of uncertainty for the decisional context (Gorry and Scott Morton, 1971, Phillips-Wren and Jain, 2007). *Unstructured* problems describe novel or unusual decisions where the provided information is incomplete, and the solution is not yet available and needs to be tailored to the problem at hand (Nursal et al., 2014). Examples of unstructured problems include e-commerce decisions, career paths, and grievances. *Structured* decisions, such as dividends, purchasing, or billing decisions (Courtney, 2001), describe recurring routine decisions with all available information and procedures for obtaining the solution already in place (Shim et al., 2002). Structured decisions are generally made by frontline and production managers and staff (Garcia-Perez et al., 2019). Lastly, *semi-structured* decisions include forecasting, budgeting, or assignment tasks and are partially programmable but still require human judgment. (Courtney, 2001).

2.2. DEFINITION OF A DSS

As it has been early on acknowledged, it is difficult to find a commonly applicable definition for DSS systems, a fact that is based on the intuitive validity of the consisting words: any system that provides data to support a decision, can be seen as a decision support system (Sprague, 1980). Already when the concept of DSS was first introduced, a claim has been raised that all "Information systems should exist only to support decisions" (Gorry and Scott Morton, 1971). Although this claim is controversial until this day (Eom and Kim, 2006), it might contribute to the fact that, despite extensive research on this topic, no universal definition has been established (Nursal et al., 2014, Zhou et al., 2008). Nevertheless, there academic research has a rather broad overall understanding of the scope and demarcation of the DSS field (Hosack et al., 2012).

An attempt to define a DSS could thus be to describe it as an "*interactive*, computer-based system which *helps* decision-makers utilize *data* and *models*"[1] (Sprague and Carlson, 1982, Sprague, 1980) to solve problems of different degrees of structure: ill-structured or unstructured problems (Hosack et al., 2012, Sprague, 1980, Sprague and Carlson, 1982), structured and semi-structured problems (Phillips-Wren and Jain, 2007), or at least the structured part of the latter (Courtney, 2001, Gorry and Scott Morton, 1971) with the human decision-maker to be the final judging factor (Gorry and Scott Morton, 1971).

The last part is crucial to note here, that DSS purely acts as an assisting unit rather than substituting either the decision-maker or the decision-making process itself. In other words, the system serves as decision guidance to the human decision-maker and acts to document, explain, and defend decisions in retrospect (Hosack et al., 2012). Despite technological advancements that provide better and faster technology to process more massive amounts of data, the unstructured nature of decisions remains. As a result, the multitude and broad offerings of different systems were unable to change the bottom line about the nature of DSS. (Courtney, 2001, Shim et al., 2002, Hosack et al., 2012).

More importantly, ambidexterity between seeing the DSS concept as technological vs. organizational has evolved. With the ongoing shift of technical aspects into the sphere of business and organizational theory, a shift in emphasis may have contributed to inconsistencies in term usage (Hosack et al., 2012). With

[1] accentuation in original.

terms such as BI / BA, DSS, being used, often interchangeably, it becomes challenging to clarify the distinction between terms and concepts. Depending on the corresponding point of view, the focus in the definition of the term can, therefore, be different. Also, multiple terms are used to describe a DSS as such. With the difficulty of finding a demarcation to other topics, the most commonly used terms are “Decision Support Tool”, “Decision System”, “Decision Tool", or "Decision Making System”. (Arnott and Pervan, 2014).

2.3. DSS EVOLUTION AND CONCEPTS

Organizational decisions have and still are becoming more and more complex and interconnected, while they are made in more diverse cultural, political, social, economic, and ecological environments. Organizations and their managers are required to react faster and different than before and must adapt their thinking to these constantly changing external factors (Courtney, 2001, Hosack et al., 2012). Simultaneously, it has been shown that the field of DSS research and practice is not homogenous and has evolved severely over time. The reduction of technological barriers, larger data capacities, and the importance of web-based technologies have made DSS easier and less costly to implement and run (Arnott and Pervan, 2008, Shim et al., 2002). Several powerful tools and concepts have emerged from DSS theories. By the end of the 1980s, Data Warehouses, Executive Information Systems, OLAP and BI concepts have taken their first steps, and finally, the increasing power of the Web has once again fundamentally changed DSS concepts as well as shaped the market (Power and Sharda, 2007). Apart from when the DSS concept was first introduced, managers are now able to make analyses themselves and find the tools powerful, convenient, and easy to use (Arnott and Pervan, 2014, Shim et al., 2002).

2.3.1. MOVING ONLINE

Especially the evolution of the World Wide Web has had an enormous impact on the evolution of DSS practice and has helped move most databases and systems online. By now, the Web has turned into a common platform for DSS. Cloud- or Software-as-a-service (SAAS) based tools are not uncommon and

offer both advanced usability and accessibility, not exclusively, but also because of reduced technological barriers, implementation, and maintenance costs. Even more so, it provides accessibility for a more significant number of users with the technical know-how requirements being minimized, enhances the collaboration within virtual or geographically distributed teams or speeds up the dissemination of analysis and decision-making frameworks (Shim et al., 2002).

Besides, data has moved physically from data warehouses to online databases and web-based DSS systems (Shim et al., 2002). Together with the place of storage, also the amount of data to be processed has changed to include high-volume, high-velocity and/or high-variety information, commonly referred to as the *big data* phenomenon. Subsequently, the boost of data magnitude requires innovative forms of data processing to improve, ease and deepen organizational insights for both, decision making, and process automation (Gartner, n.d.-b), an impact that is also acknowledged for the future of DSS research (Arnott and Pervan, 2014).

2.3.2. ANALYTICAL ADVANCEMENT

Most DSS base their functionalities on metrics and data, the fuel for organizational decision making (Garcia-Perez et al., 2019), and combine reporting and analytical functionalities to support the decision-making process (Arnott and Pervan, 2014). Today, most DSS vendors have a clear emphasis on mature analytical processes in modeling to provide corporate knowledge and insight (Shim et al., 2002). Previously, in order to allow holistic data-analysis and reporting for the individual business needs and managerial decision making, data warehouses were the most predominant concept after they came into practice in the 1990s (Courtney, 2001, Shim et al., 2002). These systems allow central data storage for all data from different enterprise-wise systems in use, as well as external sources in an aggregated form (Gartner, n.d.-c).

Data analysis capabilities, such as online analytical processing (OLAP) and data mining, evolved from data storage. Those processes can help transform unspecific data into managerial, business-specific, and contextual insights. While OLAP provides a summarized perspective of data, data mining capabilities provide a more in-depth look into data by discovering previously unknown patterns and correlations

(Abdellatif et al., 2011). The rise of Artificial Intelligence (AI) technology and simultaneously, the rapid expansion of real-time data, as explained in the previous chapter, has contributed to the maturing process of OLAP technologies into data mining (Shim et al., 2002).

AI is being used in decision support for various tasks. They can range from the initial assessment of uncertainty and risk or alerts on certain situations, over providing up-to date insights and improve decision-making skills, to finally, automate routine decisions (Phillips-Wren and Jain, 2007).

Mainly, it can be distinguished between descriptive analytics and advanced analytics, the latter including predictive analytics and prescriptive analytics. *Descriptive Analytics* describes all examination of historic, performance-centric data or content and its visualizations in pie or bar charts, line graphs, tables, or generated narratives (Gartner, n.d.-d). A more progressed analytics version, referred to as *Advanced Analytics*, elevates this concept to include autonomous or semi-autonomous examination of data using innovative data mining techniques such as ML, pattern matching, forecasting, sentiment analysis or others to discover patterns and insights, make predictions, or generate recommendations (Gartner, n.d.-a). One specific form of advanced analytics is Predictive Analytics, describing an approach to data mining with an emphasis on future prediction, rather than historic performance description (Gartner, n.d.-g). Prescriptive analytics, on the other hand, tries to provide specific recommended actions to prevent certain predicted situations from happening (Computerwoche, 2017).

2.3.3. FROM DSS TO BI

By extending the DSS concept to include data-driven forecasting, real-time analytics, or performance management tools (Watson and Wixom, 2007), areas such as BI & BA (Arnott et al., 2017) have emerged. Both terms are used frequently and interchangeably (Chae and Olson, 2013); however, the actual differentiation is not entirely clear (Arnott and Pervan, 2014). Notwithstanding, the term BI is used more frequently in academic literature. It was initially introduced by the Gartner Group Consultant Howard Dresdner in 1989 “to describe a set of methods that support sophisticated analytical decision making aimed at improving business performance” (Buchanan and O Connell, 2006). The intelligence notion is derived

from Simon's first decision-making phase (Arnott and Pervan, 2014); the process describes turning data into information first and subsequently transforming it into knowledge (Power and Sharda, 2007, Watson and Wixom, 2007).

Today, researchers and practitioners alike agree to see BI as an umbrella term describing a whole range of concepts and methods. Finally, both the organizational process to develop business insights and the technical product tools needed to improve business decision making. The baseline here is that all of these concepts and tools are technically based on Data Warehouses (e.g. Arnott and Pervan, 2014, Power, 2007a, Tutunea and Rus, 2012, Watson and Wixom, 2007)

The BI concept seems to be relevant more than any other today, which is why theorists are advised to shift their agendas of DSS research to BI (Arnott and Pervan, 2008), especially since BI concepts sometimes lack acknowledgment and representation in DSS research (Keenan, 2013). The practical BI tool market, on the other hand, is flourishing: BI is currently globally rated amongst the most relevant topics for CIOs (Arnott and Pervan, 2014). Key organizational benefits of BI application have been shown to include improved management decisions and the accomplishment of strategic business objectives on both middle management and strategic levels (Arnott et al., 2017).

3. MID-LEVEL MANAGEMENT & GENERAL MANAGEMENT THEORY

3.1. MID-LEVEL MANAGEMENT

3.1.1. DEFINITION AND ORGANIZATIONAL ASSIGNMENT

The term Middle Management (MM), often referred to as mid-level management, is explicit. It describes a manager at the intermediate level of a corporate hierarchy. The specific functional role of Middle Managers (MMs), however, seems to differ across organizational settings, the number of employees, or the industry structure (Brubakk and Wilkinson, 1996, Thakur, 1998).

The distinction to line management is the fact, that MM is considered a senior (or semi-executive) management position (Dance, 2011, Rouleau and Balogun, 2011), inducing MMs to act as company executives, which makes them superior to line managers (Dance, 2011) or first-level supervisors

(Uyterhoeven, 1989). In the reporting line, they report to the highest level of senior management. The concrete job designations can include general managers such as heads of strategic business units, or functional line managers, team- or project-related managers. (Wooldridge et al., 2008)

This range of action in the trilogy between top, middle, and lower management and thus the clear organizational assignment is probably the most distinctive feature of a MM position (Shi et al., 2009). When left out in the organizational structure, considerable gaps in the internal communication and information flow can occur (Shi et al., 2009). The combination of unique access to top management, coupled with the knowledge of operational procedures, allows actions as an intermediary between corporate strategy and daily business (Wooldridge et al., 2008). In literature, MMs have therefore often been seen as the 'linking pin' between top management and lower organizational levels, knitting together strategic goals and lower organizational activities (Floyd and Wooldridge, 1997, Shi et al., 2009) through mediation, negotiation, and interpretation (Floyd and Wooldridge, 1992, 1997). The linking pin role is mainly characterized by its upward and downward influence on strategy formation and implementation. While the upwards influence allows to impact top management views on the organizational realities and thus has the potential to shape the strategies under consideration or to trigger new initiatives, the downward influence enables MMs to take on the function of both facilitator and implementer, to steer the direction of change for the organization as a whole (Floyd and Wooldridge, 1992, 1997).

3.1.2. IMPACT ON ORGANIZATIONAL STRATEGY

Also, from a more general perspective, a large body of research has focused on the essential role of MMs concerning a companies' strategic formulation, development, and change (e.g. Rouleau and Balogun, 2011, Floyd and Wooldridge, 1992, Wooldridge et al., 2008, Floyd and Wooldridge, 1997, Pappas and Wooldridge, 2007). In this context, it is not surprising that the political dimension of MM positions has been found to be relevant, with MMs able to influence others. Different from their primary role, which would be to simply implement organizational strategy (Wooldridge et al., 2008) defined by upper echelons, their

networking position allows even to impact strategic change (Rouleau and Balogun, 2011), which is why MMs are often nominated as "agents of change" (Wooldridge et al., 2008).

In a nutshell, a MM's central position and network usage of this structurally advantageous position of MM is crucial for strategic change in a firm, leading to the development of resource advantages, and improved workplace performance (Pappas and Wooldridge, 2007). The unique role allows close relationships with all critical stakeholders at the same time, including customers, top-managers, and employees. (Radomska, 2015, Rouleau and Balogun, 2011).

3.2. GENERAL MANAGEMENT

A General Manager (GM) holds overall responsibility for a company or business unit. In this unit, he or she focuses on strategy, structure, budgets, people, financial results and metrics, and is responsible for most or at least several functional areas. This role is particularly common in large global or multinational organizations where companies are organized by product lines, customer groups, or geographical areas and hence by different divisions rather than functional units (Reh, 2019). In traditionally structured functional organizations, operations are divided into classic specializations, such as HR, marketing, and sales. In this environment, functional managers will likely make tactical and operational decisions with a clear focus on their business fragment (Garcia-Perez et al., 2019).

In particular, the transition from functional to divisional organizations, which, starting from the US in the 1970s, influenced the change of some organizational structures in Europe in the 1990s, and caused an increase in the number of GM positions. This development was initiated by the establishment of greater product diversification and the growing international activities of many large companies. While functional organizations require one central managing director, divisional organizations require one top executive per business unit, which is then located in the overall organizational middle and who is no specialist appointed as a Functional Line Manager, but a generalist appointed as GM for the entire unit. (Uyterhoeven, 1989).

According to Uyterhoeven (1989), a mid-level GM differs significantly from a top-level GM, mainly because of the complex networking nature of the role. Accordingly, a great deal of effort is required to

maintain relationships, in terms of delegation downwards, justification upwards, and on a horizontal level. This triangular relationship can cause difficulties or tensions, especially when contradictory or changing requirements have to be represented. General managers in MM-positions have to combine different skills and actions, balance operational skills against leadership skills, always maintaining a long-term perspective, and a broad overview. In figurative terms, this can be described as a multilingual role: Accordingly, in order to translate strategic goals into operational actions, a GM must speak all languages of finance, strategy, innovation, sales, marketing, operations, human resources, and technology, as well as the strategic language of the executive management (Uyterhoeven, 1989).

As shown, middle managers and especially middle managers in GM positions are mainly characterized by their unique position within the organizational structure and their specific role in an organization. The decisions they make are, therefore, also specific. This paper deals only with decisions that fall directly within the remit of GM/MM. Those in other areas of power above or below the GM/MM level are explicitly excluded. For example, a distinction is made between portfolio decisions made at the top level and those made at the lowest level, such as daily operational decisions for line managers.

From now on, the term General Middle Manager (GMM) will be used to describe the managers in those positions, representing the target group, to which this study is directed.

4. DECISIONAL FRAMEWORK FOR GMM

To make the right strategic decisions, most of them need to be based on data and analyses (Radomska, 2015). Thus, it is interesting to shed more light on the exact decisions GMMs have to make. Amongst various others, decision-making skills have been shown to be crucial for MM (Dance, 2011). Manager competencies and skills have often been targeted in prior research (e.g. Dance, 2011, Guglielmino and Carroll, 1979, Katz, 1974, Radomska, 2015) but will not be treated here. This research focuses on managers' decisions to be made only. Table 1 displays an overview of all decisions that fall into the realm of a GMM across various roles, functions, and business areas.

4.1. DECISION MATRIX

GENERIC MANAGEMENT ROLES	**INTERPERSONAL**		**STRATEGIC & INFORMATIONAL**		**OPERATIVE**
	• Shaping the work environment • Leadership • Team building • Process definition • Personal administration and time management		• Communication • Information flow management (collection, evaluation, and filtration, distribution) • Strategy definition and implementation • Reporting		• Negotiations • Resource allocation • Organizational construction • Operational supervision • Project management
	MARKETING	**SALES**	**OPERATIONS**	**FINANCE / CONTROLLING**	**HUMAN RESOURCES**
TACTICAL DECISIONS PER FUNCTIONAL BUSINESS UNIT	• Marketing Mix definition • Developing marketing programs • Market segment definition • Market demand and market size forecasting • Competitor analysis • Product planning, strategy, and road mapping • Marketing research • Supervise Marketing execution	• Customer relationship management • Account management • Contract Life-Cycle Management • Quotation management • Sales forecasting / Sales pipeline management • Sales employee Performance and Compensation Management	• Supervision of supply chain areas: plan, source, make, and deliver: • Production planning, execution and production planning optimization • Quality management • Procurement • Logistics • Process management	• Budget Planning • Strategic evaluation • Operational financial management	• Employee deployment • Employee assessment, development, and training • Leadership • Team building • Cultural definition and development • Work Process definition • Task delegation • Talent management and candidate selection
ANALYSIS	MEASURING OUTCOMES REPORTING / ANALYTICS Define KPIs, report, set goals, measurements, and targets Track overall progress for systematic improvement				

Table 1 - Decisional Matrix

4.2. MANAGERIAL DECISION MAKING

Managerial decisions can occur in three different forms: Strategic, tactical, and operational. Strategic decisions refer to long-term strategic visions of the company. Since they are directional for the future of the organization, they are often very complex and involve high risk. In the literature of decision science, strategic decisions include non-programmed decisions, unique decisions, decisions with value judgments, and vital decisions. Tactical decisions affect all those decisions that contribute to putting strategic goals into practice. Tactical decisions have elements of both structured and semi-structured decisions. Operational decisions are the most common type of decisions, as they are usually guided by company procedures and processes, are routine, and are made with low risk. Operational decisions include routine decisions, programmed decisions, performance decisions, productivity decisions, workload decisions, and outcome decisions. (Garcia-Perez et al., 2019).

While strategic decisions are mainly made by upper management and operational decisions are mostly made by line managers, tactical decisions are mostly associated with middle management (Garcia-Perez et al., 2019). At the same time, the lion's share of DSS tools also supports these tactical decisions made in MM, whereby there is a tendency for the number of applications for strategic decision making to increase, while the share of operational decision support is decreasing (Eom and Kim, 2006). This is based on the assumption that operational or tactical decisions in MM can be more easily supported by DSS than strategic decisions that are more likely to be made in senior management simply because they are unique (Garcia-Perez et al., 2019).

4.2.1. GENERIC MANAGEMENT DECISIONS

Pearson (1989) describes a framework that helps define the majority of activities GMs perform. It includes six key tasks that form the base, regardless of company size or industry: *Shaping the work environment* by defining and continually redefining the expected work quality, work ethics, company values, and general standards, *setting strategy*, *allocating resources*, *developing managers*, *building the organization* and

overseeing operations. These tasks are not detached from each other, but show interrelationships among all six areas and coexist. (Pearson, 1989)

Other theorists have also summarized MM or GM tasks and decisions; due to their significant overlaps, they can be combined. The creation of an effective working environment is mentioned in most of these concepts, alongside ensuring a smooth running of operations in compliance with organizational requirements, team building, and leadership, reporting upwards and preparing and implementing organizational strategies while facilitating change (Rouleau and Balogun, 2011, Zhang et al., 2008).

Dance (2011) splits all these tasks into three areas: *Technical* tasks, such as administration, day-to-day routines, or alignment with compliance; *people* tasks, such as leading, motivating, and developing employees. And lastly, *strategic* tasks, such as financial management, reporting, and strategic communication.

Given this, it becomes evident that there are two distinct areas into which GMM decisions can fall: On the one hand, general decisions linked to the management function and, on the other hand, decisions related to functional departments, depending on the individual GMM responsibility, industry or organizational setup. For this work, these three tasks form the basis of the general GMM decisions. To distinguish general decisions from decisions made by a GMM, the term "generic functions" is used from here on.

To investigate the decisions GMMs make in more detail, one has to look closer at the tasks they perform. Surprisingly little research deals with the question of what managers actually do. Among the first to answer this question was Henry Mintzberg, which is also linked to the fact that his theories make up a not inconsiderable proportion of current research.

Describing tasks managers are performing, Mintzberg (1991) distinguishes three different categories with roles managers have to fulfill, which exist in an integrated wholeness: Interpersonal, informational, and decision-oriented. Each role is again split into sub-roles, summing up to a total of 10. However, with every single one of Mintzberg's roles in parts having a very narrow focus, and today's DSS tools very

seldomly only covering a limited range of decisions, in this case, the three main roles form the base of this decisional GMM framework to ensure higher comparability in terms of DSS categories later on. Nevertheless, generic GMM decisions in this decisional framework are based on the Mintzberg roles due to their high acceptance in the scientific field.

Firstly, the interpersonal role largely coincides with the people tasks described by Dance (2011). As the name implies, it refers to all decisions in between a GMM and one or multiple members of the team, including general leadership tasks, such as people development, motivation or team building, as well as shaping the work environment by creating a team culture, as mentioned by Pearson (1989), Zhang et al. (2008) or Dance (2011).

Apart from task management for the whole team, aspects of self-administration for a GMM also belong in this role. With management activities being characterized by continuous interruption, managers perform their actions in an ever-present multi-tasking environment. Therefore, they are forced to react to situations and external forces instead of actively planning their tasks (Mintzberg, 1991). Nevertheless, or precisely because of this, active decisions are essential in the context of self-management. This includes, above all, their own activity management in conjunction with task delegation, the latter being dealt with further in the context of resource planning. The administration and planning of one's own tasks, time management, prioritization, and efficiency measurement and optimization are within the responsibility of the GMM.

Mintzberg's second role, the Informational role, which can be divided into the sub-categories Monitor, Disseminator, and Spokesperson (Mintzberg, 1991), is mostly concerned with the collection, processing, and dissemination of information. As outlined before, these aspects are especially relevant due to a GMM's networking role. In this realm fall all communication and networking decisions, reporting on performance and results, and tracking strategic metrics and progress. Despite Mintzberg's decision-oriented role describing a managers' involvement in the formation of strategy (Mintzberg, 1991), in order to ensure a

clear demarcation and thus easier differentiation, in this case, the Mintzberg's informational role is combined with the strategic component mentioned by Dance (2011). Hence, the informational and strategic component refers to the definition of the strategy and its implementation by defining strategic task packages and milestones. At the same time, it includes the reporting and evaluation tasks, including upwards reporting, as well as qualitative and quantitative target setting, information gathering and processing, and finally, communication with all stakeholders.

Ultimately, the role described by Mintzberg as decisional combines the sub-roles of the entrepreneur, as well as the negotiator, and the resource allocator, the latter fully matching the roles mentioned by Pearson (1989), Dance (2011) and Rouleau and Balogun (2011). Thus, all decisions regarding negotiations with different stakeholders or resource allocation are included in this role. Since Mintzberg's final role of disturbance handler refers to a management function that aims to handle unforeseen situations or conditions outside of managerial control, it is neglectable. As this framework targets all GMM decisions, and therefore, also the roles outlined before describe managerial decision making, this last generic management role will be referred to as the operative role hereafter. The potentially largest decision-making area in this operative category equals Mintzberg's entrepreneurial role or Pearson's (1989) tasks of day-to-day-business supervision. Depending on the individual sphere of responsibility, a GMM needs to make operative decisions. All further tactical decisions per functional area are subordinated to this operational role and relate to the central aspect of overseeing operations and ensuring business continuity. Pearson's (1989) last function of building the organizational structure also falls under this role. Lastly, this area has been extended to include project management, which, on the one hand, might also be attributable to an individual functional unit, but can also be universal.

4.2.2. FUNCTIONAL BUSINESS UNIT SPLIT

4.2.2.1. Marketing

The core of marketing activities can be understood as planning and executing the marketing mix, namely in the areas of product, price, place, and promotion (McCarthy, 1960). This includes business planning activities, such as the definition of the market segment or target group, competitor analysis, market demand, market size forecasting, as well as product planning, strategy, and road mapping or trend research and pattern analysis for marketing research. It also includes the actual derivation of the marketing program to include all aspects of marketing execution, such as the campaign and channel planning, target group selection, and the execution of marketing measures, which are to be supervised by a GMM. DSS programs can be applied at any point in the activities and support every step in the process. (Eom and Kim, 2006).

4.2.2.2. Sales

Several sales executive tasks require data analysis in order to make accurate business decisions. In general, sales-relevant GMM decisions can be split into three areas: Firstly, the supervision of daily sales tasks related to customer relationship management, including, among others, customer management, contract-lifecycle management, or quotation management. Secondly, sales forecasting and sales pipeline management include reporting and forecasting decisions. Lastly, sales-relevant leadership decisions comprise sales-employee performance and compensation management, which often shows different and distinct decisions compared to other functional areas.

4.2.2.3. Operations

Supervising operational practices deals with all activities related to the production and distribution of a product and can be clustered into four main processes that facilitate all activities along the supply chain: Plan, Source, Make and Deliver (Chae and Olson, 2013, Oliveira et al., 2012, Trkman et al., 2010). This includes planning processes such as capacity or production planning, procurement activities within the scope of source, all activities of the actual production process including quality management, and finally, all

logistics processes. Operations Management also includes the definition and optimization of all processes in this area, such as rationalizing processes or identifying inefficiencies.

4.2.2.4. Finance

It is striking that there are close parallels to other functional areas or GMM roles, especially for finance tasks. Decisions in this area include firstly budget planning and financials, which shows significant overlaps with the generic resource allocation task of a GMM. Decisions in the realm of strategic evaluation can often also be attributed to the strategy role. Apart from those, other operational financial management tasks require decisions made by GMMs. (Dance, 2011)

4.2.2.5. HR

HR decisions include employee deployment, development, cultural definition, implementation, and general leadership decisions. Even if the corporate culture is mostly holistic and thus predetermined by the company rather than defined in middle management, it is up to the responsible GMM to introduce and enforce team culture. By defining the requirements to employees regarding skills and values to compete effectively and what needs to be done to attract and motivate employees consistently, a GMM needs to define a people concept for his / her unit. (Pearson, 1989)

This specified value system is particularly decisive in the recruitment process and determines which candidates are considered fitting to fill vacant positions. It also helps create an effective and efficient environment to motivate employees and assist in team building, which is closely linked to the leadership decisions a GMM is responsible for.

Apart from management and leadership decisions, all decisions regarding recruiting and candidate management are crucial for GMMs. This includes not only the apparent talent management and candidate selection (Dance, 2011), but also employee deployment, process definition, and task delegation.

4.2.3. ANALYTICS

Although they technically can be considered part of the generic management area, since they are relevant aspects in each of the functional units mentioned above, the measurement of results and the analysis of performance are treated here as separate decisions with an overall perspective. This approach helps to provide a more holistic picture rather than treating each department individually. Most importantly, it is not included in the generic management area, as the reporting span ideally also includes all aspects of both generic management, as well as the individual department and operation-centric level. Performance analysis is within the oversight of a GMM and includes, as a first step, the definition of relevant KPIs and the setting of objectives and targets. This definition describes the development of a tailored metric strategy that focuses on improving decision making.

It should be noted that metrics are both context-sensitive and context-specific. For this reason, strategy definition is within the scope of the business manager, responsible for determining relevance and selecting metrics (Garcia-Perez et al., 2019).

The KPIs and reports derived from this strategy help identify how management decisions and actions - whether consciously or unconsciously - affect business results. Because business managers are accustomed to having an operational KPI dashboard, almost every organization today combines multiple performance metrics, such as function-specific metrics, into a clear visual dashboard. (Garcia-Perez et al., 2019)

In addition to defining the metric strategy and the metrics required for reporting, analytical decisions also include the actual performance analysis, in which the results are concretely measured. Depending on the responsibilities of a GMM, different functional areas, regions, or business units can be covered. The tracking of overall progress, systematic improvement, and upward reporting round off the decisions in this area and subsequently result in the definition of concrete measures in the individual functional areas.

In a nutshell, GMM decisions in terms of analytics and reporting unite the definition of a KPI strategy as well as the separate KPIs to be measured, the supervision of frequent measurement of those as well as finally, the derivation of appropriate measures from insights and results.

5. SUPPLY SIDE

5.1. CLASSIFICATION CRITERIA

DSS Vendors and their tools on the market were evaluated in terms of technical functionality and functional application. While the first evaluates the underlying technology for each feature to answer how the decision support is granted or how data is provided, the second points out the area in which the technology is applied or, more specifically, the exact decision according to the matrix framework.

When analyzing the tools, it becomes evident that three factors impact the technical functionality aspect and combined, the maturity of the tool in question: Data, analytics, and automation. All three categories can separately exist on a continuum of low to high and, when combined, reflect a detailed level of maturity for the tool. A summary of the classification scheme used to rank tools in the supplier analysis can be seen in table 2. Details are outlined in the subsequent chapters.

All evaluated tools were assessed in these individual components. This results in a jointly formed maturity score between 3 and 9, from which three were subtracted as a minimum value to obtain an objective level of 0 - 6. This score describes the overall maturity of the technical functionality of each tool. It is to be pointed out that the maturity or sophistication score does not purely rank technological advancement, but rather ranks the grade of helpfulness and holistic decision support a tool can provide to a GMM.

	DATA	ANALYTICS	AUTOMATION
Low (1)	Structured data Spreadsheets or manual data entry (e.g. decision trees)	simple statistical analysis and KPI calculation	Rule-based workflows
Medium (2)	Department focused (no or sparse integration to other tools or data from multiple sources)	Descriptive analytics (visual analytics, dashboards, scorecards)	Automation based on calculations (e.g. prioritization or simulation)
High (3)	Integrated, horizontal cross-department data (data warehousing)	Advanced analytics (diagnostics, predictive (modeling), prescriptive analytics)	Advanced automation (AI, ML or NLP capabilities)

Table 2- Functionality Structure DSS

5.1.1. DATA

The underlying data (model) forms the basis for each DSS, and its structure determines technical possibilities for the functions and analyses that build on it. It can be available in different maturity levels and thus also influences the development level of the following categories.

As described in previous chapters, modern data warehouses offer a broad and holistic picture of all available data, because of its integrative approach. Integration with other data sources or tools helps to promote central data storage to avoid isolated solutions and gather a holistic, integrative view (Tutunea and Rus, 2012). This managerial aspect is crucial because data storage on independent islands can be challenging for organizations, as it only displays a fraction of the truth (Forrester, 2019d).

Thus, the following applies: The more integrated and comprehensive the database, the more sophisticated is the DSS foundation. The lowest level of sophistication describes data that is either available in structured spreadsheets or has to be entered manually and is therefore susceptible to manipulation or human bias. Data of the middle level are determined automatically but only refer to one area or department. Little or no integration with other data sources is available. Finally, a database has a high maturity, when, in addition to automatic data collection, horizontally integrated data is available across multiple departments or even from external sources, similar to the function of a data warehouse.

5.1.2. ANALYTICS

As illustrated in 2.3.2., the analytical functions are probably the most essential part of a modern DSS and can be divided into descriptive analytics, the declaratory view on past performance data, predictive analytics, the use of special algorithms to predict future behavior, and prescriptive analytics, the use of Machine Learning (ML) algorithms (Holsapple et al., 2014).

When analyzing a tool's analytical sophistication, both low and medium levels target descriptive analytics patterns. While the lowest level includes data aggregation, simple statistical analysis, or graphic processing of a singular, calculated KPI, tools of the medium level are capable of combining multiple metrics or KPIs for better comparison in e.g., visual dashboards or scorecards.

In practice, most organizations in 2019 still use some kind of business dashboard out of metrics as a reporting tool (Garcia-Perez et al., 2019), making anything more advanced above average. Therefore,

advanced analytics, including predictive analytics and prescriptive analytics, are combinedly considered to show a high level of analytical functionality.

5.1.3. AUTOMATION

According to Tutunea and Rus (2012), the analytical concept can be extended by the idea of automation, which automatically understands data and applies a combination of predefined logics or makes suggestions. To date, AI and its sub-area, ML, have developed from a futuristic vision to an almost mainstream capability in many companies. On the one hand, automation can already be used to inform the decision-maker about certain situations, but it can also process smaller routine tasks independently and rule-based (Phillips-Wren and Jain, 2007).

Therefore, new technological advancements are used for the last functional component of a DSS, namely the automation component, even though one must be aware that there are some significant overlaps with the analytics component. Low automation is given for DSS functionalities with simple, rule-based automated workflows that can be set up variably. Medium automation describes any flexible workflows that are based on calculations and thresholds. Lastly, high automation includes advanced automation possibilities, supported by AI or ML capabilities. Particularly at this point, there can be a high overlap with analysis-relevant cases, since AI / ML aspects are equally crucial for prescriptive analytics. Thus, the distinction is made here: A tool with both highly developed analytics and AI & ML capabilities, i.e., highly developed automation capabilities, has a higher degree of maturity in both analytics and automation, while a tool with advanced reporting functionality only may lack sophistication when it comes to automation.

5.2. VENDOR ANALYSIS

DSS vendors and market leaders in their field are quite common among the top digital or innovative company rankings, underlining the progressive maturity along with all three aspects of data, analytics, and automation. For example, Workday, as the market leader in HR-specific DSS (Gartner, 2019d), is ranked as #2 of the most innovative companies, according to Forbes (2018).

There is no doubt today that systems support the role of a decision-maker and thus facilitate decisions, but by no means replace them altogether. These issues are relevant in all the major traditional business disciplines: marketing, human resources, business strategy, operations, supply chain, information technology, and finance (Holsapple et al., 2014). An analysis of the research literature shows that the dominant application area for DSS is production and operations, followed by marketing and logistics and the field of management information systems – these types of DSS systems fall under generic DSS systems in this classification. Systems supporting finance (6,49%), strategic management (3,9%), and human resources (3,9%) show the lowest number of application areas. However, DSS in the sales area, for example, is not mentioned (Eom and Kim, 2006). In practice, at the same time, spreadsheets are still used for most organizational decision support (Courtney, 2001).

Over a decade ago, a distinction was made between front-end systems that perform evaluations to display them in a user interface and back-end data warehouses or systems with database components that aggregate data. Today, this transition is fluid: most tools combine both seamlessly and collect the data, analyze it, and make the evaluation available to the user (Power, 2008). The market for DSS is agile: innovations are made quickly, mergers between providers are common, and the market situation changes rapidly, making accurate analysis difficult (Shim et al., 2002). Even though this statement has been made several years ago, it today is just as valid as any other time.

To obtain an overview of the current market offering in Germany, Austria, and the CEE, a total of 230 tools were listed as a cross-section of the current market supply, and each instrument was evaluated individually. Tools were compiled from widely acknowledged practical market reports such as the Gartner Magic Quadrants, Forrester Waves, Nucleus reports or general vendor lists such as Capterra or other category lists, as well as from in scientific research acknowledged sources on DSS such as Dssressources.com (Bhargava et al., 2007). This way, a representative profile of the market offer was compiled.

Each respective system was evaluated in all three categories, according to its database, analysis, and automation functions, and its corresponding sophistication score was determined. Besides, each tool was

classified according to both the system category and the relevant area in the decision matrix. Scoring data to help score the functionality was drawn from the vendors' homepage and the information, the vendors provided publicly, as well as other market reports. Apart from the separate scoring for each individual tool category, which lies between the threshold of 1-3, an overall total score of 0-6 describes the overall sophistication for a DSS category.

An average of 0-2 for the total score determines a low grade of sophistication for the category, 2,1 – 4 a medium grade. All tool categories above 4 can be seen as highly sophisticated to support GMM decisions. An overview of the gathered results is displayed in Table 3.

DECISION AREA	TOOL CATEGORY	NUMBER OF EVALUATED TOOLS	SCORE AVERAGE	SCORE MEDIAN	STANDARD DEVIATION	LEVEL	DATA AVERAGE	ANALYTICS AVERAGE	AUTOMATION AVERAGE
Generic									
Strategic & Informational	Business Planning & Strategy	10	3,3	3	1,49	medium	2	2,2	2,1
Operational	Generic DSS	35	1,46	2	1,42	low	1,14	1,71	1,6
	Negotiation Support	1	1	1		low	1	1	1
	Project Management	7	1,43	2	0,98	low	1	1,43	2
	other fragments	7	2,43	2	1,4	low	1,43	1,71	1,86
Functional: Sales									
	CRM	16	3,6	3	1,17	medium	2,06	2,5	2,6
	other sales fragments	3	4,33	5	1,15	high	2	2,67	2,67
Functional: Marketing									
	Multichannel Marketing Hub	21	4,85	5	0,36	high	2	2,84	2,95
	other marketing fragments	4	4,5	5	1	high	2	2,75	2,75
Functional: Finance									
	Financial Management	5	4	5	2	medium	2,6	2,4	2
	Financial Planning & Analytics	14	4,21	4	1,53	high	2,64	2,29	2,26
Functional: Operations									
	ERP	10	4,5	4,5	1,27	high	2,7	2,4	2,4
	Supply-Chain Management	8	3,71	4	1,38	medium	2	2,13	2,26
	Process Management	2	6	6		high	3	3	3
	other operations fragments	2	2	2	1,41	low	2	1	2
Functional: HR									
	HCM	28	3,32	3	0,9	medium	2,04	2,14	2,18
	other HR fragments	12	2,08	2	1,08	low	1,5	1,6	2
Analytics									
	BI	34	5,12	6	1,34	high	2,82	2,59	2,68
	department-related analytics	5	4,2	5	1,1	high	2	2,6	2,6

Table 3 - Market supply sophistication per decision category

5.2.1. GENERIC MANAGEMENT

Especially in the general interpersonal role of a GMM, decisions made, such as team building, leadership activities, or the definition of the team culture, are often anchored in HR-specific DSS. The overlap of functionalities between HR-relevant and interpersonal generic management is too unspecific to be read as a separate set of software. Therefore, decisions made within a GMM's interpersonal role will be mapped with HR-specific DSS tools in 5.6.

Apart from managing others, a GMM makes decisions to manage his very own workload and administer his schedule, time management, and self-efficiency. Various tools can help with that, as they can help understand how much time is spent on which type of task or how to improve self-efficiency based on these insights.

The situation is, however, different for a GMMs' strategic & informational role. Communication and collaboration, as well as information flow management, are often assisted by collaboration tools. Even though they help funnel different discussions and opinions or gather collective intelligence, they do not actively provide decision support and therefore are excluded in this research.

Most tools offer both support for strategy setting and execution and business planning, despite the two processes being fully independent. Due to these overlaps, both were combinedly analyzed here. It is striking that this is the only category to show medium sophistication throughout all of the generic management areas, with an average score of 3. Even though analytics functionality scores slightly higher (2,2) than data (2) and automation (2,1), no considerable level difference between the three exists. Even though the number of both tool categories is small, more tools focus on strategy execution tracking rather than business planning. Continuous strategic planning rather than periodic planning in a yearly budgeting phase, together with thorough analysis are crucial for companies not to jeopardize the quality of decision making and its outcome (Mankins and Steele, 2006). Strategic business planning tools often overlap with financial management, financial projecting, or business management tools. On the other side, strategic

planning tools also overlap with project management and task organization or even HR resource planning tools.

There are also several tools relevant to the operative role. Those can be differentiated into Generic Decision-making tools, negotiation support tools, and lastly, project management tools. Tools to support operational supervision are clustered in the individual departments and are discussed in detail in the upcoming paragraphs. Generally, it can be seen that none of the tool categories to support operative decisions shows a medium or high grade of maturity. On average, all three categories score low. The majority of tools are characterized by manual data entry or narrow data integration functionalities, as well as a lack of analytics beyond data visualization, KPI calculation, or flexible workflow definition.

Generic DSS considers software that exclusively covers all aspects of decision making. The analysis of 35 tools in this category shows that most tools offer functionalities such as decision tree analysis, cost planning, and forecasting, key performance indicators, Monte-Carlo simulations, rule-based workflows or sensitivity analyses, decision modeling, or scenario planning. Some tools also include collaborative decision-making aspects, which also can be assigned to the interpersonal GMM role. Despite the extensive range of functionality and the high number of tools, they only show a low level of maturity with an average score of 1,46; Analytics (1,71) and Automation (1,6) score slightly lower than data (1,14). The severely low data scoring is mainly caused by predominant manual data entry, e.g. through decision tree modeling.

Additionally, platforms to seamlessly build company-own decision applications help automate individual or custom processes without the need for any coding. By visually diagraming decision trees, or simply and visually displaying processes modeling or similar, smart applications can be built, which has highly arrived in the practical world (Forrester, 2018). However, process sovereignty still lies with the IT and not with the business side, or more specifically, GMM, which is why decision platforms are actively excluded.

Negotiation support systems differ from other decisions in several ways: They do not only involve one decision but rather several independent, consecutive decisions that are made in an iterative process to resolve a conflict of interest between two or more parties (Power, 2007b, Vetschera et al., 2011). A DSS can help resolve the conflict either by assisting the decision-making process or by improving the communication between the involved parties (Kersten and Lai, 2007). Negotiation DSS have been shown to reduce the complexity of the negotiation process and, as a result, increase the probability of reaching an agreement (Griessmair et al., 2011), as well as user satisfaction and outcome quality (Kersten and Lai, 2007).

Despite DSS's use for negotiation support being a relevant topic in DSS research, it has a relatively low professional and managerial relevance (Pervan and Arnott, 2014) and very scarce practical use (Kersten and Lai, 2007). There currently are only three systems on the market (Vetschera et al., 2011), with two of them created mainly for teaching and research purposes. Not surprisingly, the remaining one is characterized by a low level of all three data, analytics, and automation.

In terms of **project management**, a predominant manual data entry also necessitates a low average score of 1,43. The analytics (1,43) and automation (2) components score higher, with most tools focusing on automation sophistication, such as prioritization or other flexible workflows.

5.2.2. FUNCTIONAL SPLIT

5.2.2.1. Marketing

Overall, there are numerous different DSS types to support marketing decision-making along all steps of the marketing mix. Marketing probably offers the most diversified systems to support various operational aspects of daily marketing operations, ranging from customer journey platforms or brand management platforms, through social media campaign or content management platforms, to general marketing measurement and optimization solutions, just to name a few. Overlaps in functionality between these systems are common.

The term enterprise marketing software suite might be the most fitting terminology for a holistic marketing DSS, which allows a GMM to oversee marketing operations, as it does not limit functionalities to a fraction of marketing activities. To this date, only very few vendors offer a unified marketing software suite to combine customer data management, customer analytics, campaign orchestration, marketing resource, and content management and the measurement and optimization of marketing performance under one roof. (Forrester, 2019c)

The closest to this come Multichannel-Marketing Hubs (MMH), sometimes referred to as marketing automation (Gartner, n.d.-e), or cross-channel marketing campaign management (Forrester, 2019b), which is why they were combinedly evaluated as one system category are seen as the main DSS category for marketing management and GMMs overlooking marketing activities.

MMH helps orchestrate segmented communications or campaigns across multiple channels, such as websites, mobile, social, direct mail, or others. Therefore, functionality includes all aspects regarding segmentation, campaign planning, creation and execution, and delivering data resulting from these activities (Gartner, 2019f). But apart from personalized marketing orchestration, some also offer customer data management and customer insights, loyalty management, content management, customer journey management, or e-commerce functionality.

It is striking that MMH show the highest average score of 4,85 across all functional DSS tools, with 21 MMHs evaluated. Simultaneously, a low standard deviation of 0,36 allows high overall market comparability.

Automation seems to be the most crucial factor for MMH tools: With an automation average of 2,95, almost all vendors offer advanced automation capabilities and have ML, AI, or both in their toolset. Also, many vendors provide fully automated segmentation or targeting and, therefore, highly sophisticated automated decision making for campaign execution.

Analytical capabilities also show a very high score of 2,84, the highest analytical average across all evaluated categories. Most vendors display both aspects of the marketing department's performance, such as marketing analytics, and on the performance of customers, including customer analytics. (Gartner, 2019f)

However, many tools lack behind in terms of database, especially regarding an integrative approach, despite its utmost relevance in the field. Sales and Marketing are the prime example of why data integration is key. Hardly for any two other business areas, data combination is so important to get a more holistic picture – a fact that has long arrived in the practical world (Internetworld AT, 2019). Therefore, marketing automation tools or MMH tools often offer capabilities to integrate with sales execution in B2B and B2C environments, for example, when it comes to lead handling or customer data (Gartner, 2019f). The goal is to effectively integrate data from different sources to get a 360-degree view of the customer in a unified profile, including data from internal systems, such as data warehouses, sales data or website data, and external systems or third-party data providers. Both effect and efficiency of all marketing activities are based on customer data (Gartner, 2019f, regalix research, 2019).

As mentioned, several other tool categories cover parts of marketing operations. The operational focus decreases the relevance for GMM decisions; the functionality base is vast. Four additional marketing tools from different categories were evaluated. Fragments show a slightly lower score (4,5) than MMH suites, are, however, able to maintain a high level overall, with automation and analytical capabilities scoring with 2,75 each. Data again is limited to marketing-based data only or maximally integrated with sales data.

5.2.2.2. Sales

When looking at sales-centric DSS systems, Sales Force Automation (SFA) and Customer relationship management (CRM) are the two most commonly acknowledged system categories. Gartner differentiates three different sales-relevant categories, being CRM, Sales Force Automation, and Performance Management.

The difference between SFA and CRM is fluid. While many use the terms interchangeably, the difference lies in the emphasis they place on the target group. While a CRM deals with the maintenance of customer relationships and puts the customer at the center of attention, an SFA aims to make the sales

employee's activities more efficient (Rolustech, 2020). Functionalities mostly overlap - Most SFA tools can be classified as CRM tools and the other way around (Astute, 2017, Gartner, 2019g, Rolustech, 2020).

However, CRM has evolved to be the most important tool for sales department support. It can be argued that CRM platforms can be split into two separate types: SFA CRMs, mainly relevant for B2B companies, as well as Customer Engagement Center (CEC) CRMs, primarily relevant for B2C companies, supporting Customer Engagement in service departments and contact centers (Astute, 2017, Gartner, 2019i).

The focus on putting the customer in the center of attention to enable a 360-degree view causes a shift from CRM to Customer Experience Management. The focus is no longer on the company's departments, but on marketing and sales activities designed to satisfy the customer as much as possible (Absatzwirtschaft, 2017). Modern CRM platforms move from an operational to a strategic approach (Forrester, 2019a). All 16 analyzed CRM tools show account, opportunity, and pipeline management as a core functionality. Some offer other additional capabilities to support marketing functions, contract management, quote and order processing, or customer service management.

CRM tools show an average score of 3,6 with a medium database score of 2. Even though some vendors offer integrative possibilities to other systems, most CRM systems work with isolated sales data. The focus seems to be automation, which has the highest score of 2,6, which is not surprising as most CRM systems focus on providing sales automation to the sales force, as outlined above.

Although many tools combine a growing number of functionalities from marketing and sales to unite several decisions in a single system, they seem to ignore many technical possibilities. Because historically, CRM has been developed more and more on a broad scale than at the forefront of innovation, even though there are multiple practical use cases, especially for AI & ML (Marconomy, 2019). To improve data gathering, text recognition with sentiment evaluation, orchestration or automated processing suggestions or the analysis of threshold values or predictive indicators and to support this shift towards customer experience offering, the analytics and automation components of CRM Systems have to catch up. (Gartner, 2019g, Nucleus, 2018)

There is a multitude of subcategories in the sales area. As expert systems, they are focused on a particular process, such as systems for quotation configuration, contract management, or sales performance management (SPM), the latter being potentially the largest of the fractional systems. The SPM market grew by 13% to USD 950 million in 2018, mainly influenced by new technologies such as algorithmic analysis and ML, with market growth lagging behind sales automation (at 15,3%) and the entire sales segment (at around 16,6%) (Gartner, 2019j).

SPM allows decision support for sales managers to manage sales staff targets and compensation, among other aspects. The market standard includes advanced analysis methods that already give the system standard a certain maturity. Creating synergies by combining SPM with other solutions is not uncommon and sometimes even crucial to improve decision support value (Gartner, 2019h).

Other tools to support fragments of sales decisions are contract management or sales-specific generic DSS tools. The analysis shows that tools which support fragments of the sales process offer both more mature analytics and automation (2,67 each) than CRM systems, however, the database remains limited with an overall average of 4,33. Fragments tend to be more mature than CRM, which may be because a focus on one process seems to have allowed vendors to invest in technological advancement on the analytics and automation level.

5.2.2.3. Operations

Enterprise Resource Planning (ERP) software as a centralized data repository (Chae and Olson, 2013) is the backbone of many organizations and an indispensable part of the enterprise software ecosystem that controls processes and increases their efficiency. As a central recording system, it provides an essential link between finance, planning, marketing, CRM, operations, supply chain management, and HCM (Nucleus research, 2019b). It is one of the largest categories of enterprise software spending, with an expected annual growth rate of 7,1% through 2022. (Gartner, 2019b). The traditional core functionalities, which also the 10 analyzed ERP tools display, cover some or all of supply-chain and manufacturing-related functionality, such as demand management, inventory management, supply chain/direct procurement, manufacturing control

capabilities, and distribution/logistics, financial management functionality, purchasing, HCM functionality or industry-specific modules or applications such as asset management, configure-to-order, product life cycle management or field service management. (Gartner, 2018)

However, the standard ERP process does no longer suffice to give companies a competitive advantage. To describe a high sophistication of ERP systems, Gartner (2019g) uses the term "postmodern ERP". The goal of a postmodern strategic approach to ERP is identified to automate administrative and operational capabilities and simultaneously create a higher level of integration between various systems and processes, investing in both high-level data and automation aspects. Gartner (2018), (n.d.-f). This approach becomes visible in the shift of traditional ERP vendors to offer functionality beyond the traditional scope of ERP (Gartner, 2019e). Along with the postmodern ERP approach, many ERP vendors today already show a high level of functional maturity with an average score of 4,5. Especially advanced is the high level of data integration (2,7) compared to analytics (2,4) & automation (2,4), which however are at a comparable level. Vendors invest heavily in ML use cases - mainly in the form of pattern recognition in large datasets - and AI, to close this gap (Nucleus research, 2019b).

Apart from ERP Systems, various additional tools are on the market to help and support different steps of the operations or the supply chain process. However, most of these tools only support a narrow bandwidth of processes and mainly focus as expert systems on a minor niche process, such as additional procurement or quality management software, as well as supply chain execution or process management software. The latter targets the identification, design, documentation, implementation, control, and optimization of business processes. In other words, it helps identify inefficiencies or ineffectiveness of processes. Improving both effectiveness and efficiency of supply chain analytics and the insights gained are essential for developing and maintaining a competitive advantage (Trkman et al., 2010).

For many companies, Microsoft Excel or other spreadsheet applications are still essential for managing supply chain processes, not least on account of their flexibility, not seldomly leading to problems because of their silo characteristics. (Nucleus research, 2019a). Even though an integrated data set plays a

vital role as a basis for planning and analysis (Nucleus Research, 2018b), many SCM tools show lacks in data sophistication with an overall medium score of 3,7. Automation and analytics are slightly more sophisticated than their data component, but not considerably higher. Especially compared to ERP systems directly, they fall behind.

When looking at other fractional systems, they fail to convince with a low average score of 2 and lack of substantial analytics function, despite the data & automation score on a medium level. Process Management tools were evaluated as another operational fraction system. There are only a few tools on the market, they display a high sophistication, especially in terms of automation. They use mainly AI/ML algorithms to allow sophisticated and automated data analysis through multiple areas and show high sophistication on all levels.

5.2.2.4. Finance

In the finance area, two major DSS tool types can support a GMMs' decision making: Financial Management and Financial Planning and Analysis (FP&A) tools. Financial Close systems, which represent another software category relevant for the finance area, are excluded here, as they target mainly operational processes in the finance administration and, only to a limited extent, offer data that supports GMM decisions. Data that forms the base of financial decision-making in MM is rather found in core financial management suites.

ERP tools that often cover financial functions are treated in chapter 5.2.2.3, as most functionality for ERP systems still lies in the responsibility of the operations department. However, it is to be noted that most Financial Management solutions are part of a larger ERP suite (Gartner, 2019b), where they then show improved and more integrated data capabilities.

FP&A solutions support the finance department's budgeting, planning, and forecasting tasks by modeling or scenario planning, collaboration, or performance reporting capabilities (Gartner, 2019d). All 14 evaluated tools show this functionality.

Maturity in the field of FP&A analytics involves the analysis of detailed operational data, e.g., by the use of additional data sources, and calculations to examine the impact of multiple scenarios. This can help make strategic decisions and facilitate an understanding of performance drivers (Gartner, 2019c).

FP&A tools are characterized by a high degree of integration (2,64), even though there still exists a significant gap for FP&A solutions to reach their full potential due to their historical lack of integration capabilities, which primarily impacts that they fall behind BI systems (Gartner, 2019c). The integrative approach is still more advanced than analytics (2,29) and automation (2,26). On an automation level, the current use of AI models for financial modeling purposes is scarce, but growing, with predictive forecasting and AI-based statistics being used increasingly (Gartner, 2019c). Anyhow, FP&A tools reach an overall high level of 4,2.

Compared to financial planning as a tactical or even strategic decision, financial management suites, sometimes referred to as corporate performance management (CPM), follow a somewhat operational approach.

The 5 analyzed tools majorly support operative accounting processes. The market offering is widespread; the tools show a medium score average of 4, but simultaneously have a very high standard deviation of two, so there is low comparability of different systems in the same category. The database (2,6) score is comparable to FP&A systems. Analytics (2,4) scores a little higher, automation (2,0) lower than tools evaluated in the FP&A category. Comparing data from multiple sources due to integration with other tools brings greater security to company decisions and allows complete analysis. Financial analytics and reporting capabilities, including the provision of financial information and key performance indicators to managers and executives, are gradually being targeted with AI and ML (Gartner, 2019b) (McMillan and Nucleus, 2019). Vendors not only roadmap to elevate their systems to a new technological standard, but the gap between FP&A and financial management suites is also predicted to be minimized through 2024 (Gartner, 2019b).

5.2.2.5. HR

Last year, PWC described the current state of the art to support a human HR decision-maker, stating that in European companies, 40 percent of the HR- functions are currently assisted by AI-applications; every other company is planning to invest in data analytics to find and develop talents and keep people loyal to their corporations. For the HR, most AI-applications available so far are designed for the recruitment and hiring process (PWC, 2019).

This shows that today, HR DSS tools can support decisions that go far beyond Basic HR-application cases such as the selection and assignment of human resources, tasks, or jobs or plan training courses (Eom and Kim, 2006). The analyzed tools show that they are nowadays able to manage all touchpoints of the employee journey, starting at the hiring process and helping manage, motivate, and develop existing employees. About half of them give employee support for self-service and administrative tasks. Main Characteristics also include administration, payroll and benefits administration, Absence and compensation management, training & development, and self-service for all candidates, employees and managers, and reporting. (Nucleus Research, 2018a)

When naming and describing HR systems, many acronyms are used, it seems almost by random: HRIS (Human Resource Information System), HCM (Human Capital Management), HRMS (Human Resource Management System) or HRM (Human Resource Management), TMS (Talent Management System), or LMS (Learning Management System). The three most common terms are HRIS, HCM, or HRMS. The vendor and analyst landscape is not on a 100% agreement level on all acronyms and their differences and similarities (HRMSSolutions, 2019).

Anyhow, HCM seems to be the most commonly used terminology for advanced DSS software (Gartner, 2019d, Nucleus Research, 2018a, Nucleus Research, 2019d) to support most if not all relevant HR decisions. Therefore, this term will also be used in this context, if not otherwise indicated, to describe extensive, holistic HR-related DSS.

ERP tools that often cover HR functions are treated in chapter 5.2.2.3, as the lion's share of ERP functionalities still lies in the operations department's responsibility.

There are a number of HCM systems on the market; 28 were analyzed and show an average level of 3,32. They seem to have almost equal sophistication grades for data (2,14), analytics (2,4), and automation (2,18). This displays a lack of integration and advanced technology, which has not yet made it into standard HCM tools despite the outliers of innovative HCM vendors. Visual dashboards predominate in 22 out of 28 tools; also, HR-centric and limited data prevail.

As specialists rather than generalists, the number of tools that cover only a sub-area of HR decisions is quantitatively much more diverse, even though only 12 additional tools were evaluated here. Probably one of the most concise areas is Talent Management Systems, which are often mentioned as separate system areas, and act as a base tool for finding and selecting candidates and managing all steps along the hiring process (Gartner, 2019l). However, with market leaders offering end-to-end HCM solutions with talent and candidate management being one component, industry experts, as Gartner (2019d) or Nucleus (2018a) predict for TMS to go extinct and that, to avoid silos, HCM solution will be the only option worth considering in the future.

With increasing management of employees as relevant stakeholders, like customer journey management or customer experience management, Workforce Engagement Management (WEM), sometimes referred to as Workforce Experience Management (Gartner, 2019d), and its subcategories of Workforce Management and Performance management, handle decisional fractions of the HR process. Aspects include recruitment and onboarding processes, evaluation and improvement, time management, assistance, and task management or similar (Gartner, 2019j). However, with their focus on operational decisions and employee self-management, WEMs are part of the HR fraction list. The data provided for supporting GMMs in their decisions is narrow.

It is thus not surprising that fractional HR-DSS cannot convince with satisfaction. With the automation component being the one most mature (2), data (1,5) and analytics (1,6) aspects fall behind. Most vendors fail to offer both relevant data integration or automatic data processing and mature analytical capabilities. In recent years, providers have tried to expand the use of ML and AI, not only for reporting and

analysis but also for automation. For example, AI in the recruiting process can help predict, accelerate, or even automate the procedure. AI can also help gain insights and identify relationships that might otherwise remain undetected, such as gender bias in performance feedback. (Skinner and White, 2018) (Nucleus Research, 2019d) (Gartner, 2019d)

5.2.3. ANALYTICS

Across functional units, BI and BA systems act as highly relevant generic management tools by providing timely and high-quality information to assist decision making for multiple departments at a holistic level. Modern solutions frequently combine central data storage in a data warehouse, data analysis technologies such as OLAP techniques and data mining, and finally, the mapping of the knowledge gained in a user interface (Tutunea and Rus, 2012). Therefore, it does not come as a surprise that BI tools score highest on average (5,12) with a high sophistication level on data, which forms a solid base for more sophisticated analysis and automation capabilities. Data scores highest of all categories (2,82). Analytics (2,59) and automation (2,68) also display a high-level score.

At data level, a BI application is characterized by combined data from multiple sources and an integrated approach. The focus is on this integrated database as a component, as well as corresponding analysis methods. Although BI systems are often mentioned in the context of financial reporting (e.g. (Holsapple et al., 2014), the areas of analysis refer to other KPIs and reporting measures such as marketing, HR KPIs such as staff turnover, sales KPIs such as pipeline, win/loss overview and various others (Chae and Olson, 2013). In addition to simple visual or descriptive correlations and KPIs, predictive and prescriptive analysis methods play an increasing role.

Of course, at the automation level, ML or AI developments also influence BI and ensure that conventional BI systems develop beyond visual-based data development (Gartner, 2019a). Driven by cloud technologies since 2018, all leading providers in this field are now investing in AI. Autonomous tools achieve unprecedented levels of operational control and data access, realizing dramatic benefits through time savings and increased user productivity. (Nucleus Research, 2019c)

The Number of BI systems on the market is extensive; 32 of them were analyzed here. And the concept of BI extends far beyond simple statistical analysis, as provided in statistical tools such as SPSS, R, or others.Vendors of traditional BI platforms have evolved their capabilities to enable modern, visual-based data discovery, including governance and advanced analytics. Newer vendors are evolving the capabilities that were previously focused primarily on agility by extending them to enable better scalability and collaboration. A strong emphasis is set on innovation and visionary roadmaps; there is no single vendor that is innovative in a way that is exceptionally different from the others. Therefore, the character of innovation does not go beyond currently advanced analysis or automation methods (Gartner, 2019a).

5.2.3.1. Department analytics

As specialized tools for a particular area, department analytics support line managers or functional managers with insights. However, for GMMs, they only offer a fractional part of the information needed to make holistic decisions. Analyzing 5 tools providing department analytics for different departments, it becomes visible that their lower average score of 4,2 compared to BI systems mainly can be led back to lacks in data linked to their moderate integrative approach. Both their analytics and automation scores of 2,6 equally, are similar to BI scoring. Analytics and automation capabilities are similar to BI.

6. DEMAND

More than 15 years ago, Vlahos et al. (2004) filled a research gap that had previously existed regarding the use of DSS tools among German managers. They were able to show that both the perceived value and the satisfaction with DSS use are most pronounced in the accounting and finance sector - marketing, sales, and human resources lag behind in both aspects. Besides, it has been shown that those systems that support resource allocation, evaluate alternatives, identify problems, and make short-term decisions can support managers most effectively. Especially for middle and upper management, systems that deliver reporting showed a higher level of satisfaction and perceived value than flexible inquiry and analysis systems - a

surprising contradiction to frequently pointed out aspects that more flexible inquiry and analysis systems would better satisfy the information needs of a manager (Vlahos et al., 2004).

Apart from that, the amount of empirical research dealing with the use and demand of DSS, especially for MM, is limited. After a detailed analysis of market supply in the previous chapter, demand has now been analyzed to conclude possible discrepancies between these two aspects.

6.1. METHODOLOGY

Especially sample surveys have been shown to be underrepresented in BI and DSS research (Jourdan et al., 2008). While many other studies focus on strategy from the IT-responsible side, very few validate these strategic decisions from a business management side. This study closes both of these gaps. GMMs in Germany, Austria, and the CEE were surveyed to investigate their use of DSS for operational, tactical, and strategic decisions. The data was gathered via an online questionnaire, which was made available in both English and German. The survey was set up in English and then translated to German, with the structure and response options remaining as original. It was up to the respondents to choose the language of participation, a cross-reference to the questionnaire in the other language was given at the beginning.

The total sample consisted of 1937 GMMs. These managers were selected on the most predominant two professional social media networks: LinkedIn from an international standpoint, as well as Xing, the latter being majorly predominant in the German-speaking region. Since the managers on these networks are themselves responsible for maintaining their public profiles, most of this data can be assumed to be up-to-date and accurate. Thus, the managers' name, the company name, and the job title are publicly visible on the profiles. The selection of the target group was based on the job title and the region or country of operation. The selection at country level was made for Germany (DE), Austria (A), the German-speaking region (DACH) and the corresponding central-eastern European (CEE) countries: According to this, a large part of the target group [1022] is from Germany, 358 managers from Austria and 557 from the CEE countries, mainly Poland, Hungary, and the Czech Republic. The selection of the target group according to the job title specification covered the following search terms: General Manager, Division Head, Division

Manager, Regional Head, Head of Business Unit, Divisional Manager, Business Unit Manager, either used alone or in combination with regional names such as DACH or CEE. All CEE countries included were Albania, Bosnia, Bulgaria, Estonia, Kosovo, Croatia, Latvia, Lithuania, Montenegro, Poland, Romania, Czech Republic, Serbia, Slovakia, Slovenia, and Hungary. German search criteria, such as 'RegionalleiterIn', 'BezirksleiterIn', 'BereichsleiterIn', 'Divisionalleitung', and minor deviations from these were added. Since the filter function searches for keywords and similar alternatives, minor deviations from these search terms were included as well as firm-individual specific job descriptions according to the individual business unit or division names, which are hardly comparable across different operations.

After compiling the corresponding sample list consisting of first name, last name, company name, job title, and country, the individual managers were contacted by e-mail, not least because of the technical limitations of contact options via the social networks used for sample selection. Due to the widespread use of the e-mail address format ‘firstname.lastname@companydomain.com’ in enterprises, 70% of the addressees have been successfully contacted, whereby the company domain including ending can be found in the imprint of the company website. As mentioned, the survey version in English and German was provided, giving GMMS the possibility to choose the preferred language option. As an incentive for participation, the participants were offered to receive the research results per mail after completion. E-Mail addresses were evidently excluded from the data-set prior to analysis to ensure anonymity and data protection.

	total	male	female
Sample Size	1937	1617	319
Successfully contacted	1352	1141	211
Responses	188		
Fully answered surveys	103		

Table 4 - Sample and response structure

A clear gender imbalance can already be seen in the original sample group structure: With 83 % male and only 16 % female, the proportion of male GMMs predominates. However, as the sample was selected randomly, it is to be pointed out that the gender imbalance is not caused by the sample selection, but rather by the gender imbalance in the position nomination.

6.1.1. QUESTIONNAIRE STRUCTURE

At the beginning of the questionnaire, participants were asked to select the relevant functional business units they supervise. Question branching for all department-relevant aspects was based on the responses to this question, to make sure to only display relevant questions. The minimum selection of questions and thus generic selection of sub-areas for all participants covered all generic management areas: generic decision support, as well as strategic goal setting, tactical planning, reporting and the HR area due to its overlap with the interpersonal role and related leadership and management decisions. The functional areas of Marketing, Sales, Operations, and Finance were only displayed upon selection in the starting question.

Subsequently, an assessment of the current DSS use was requested. This included an estimate of the proportion of decisions already based on computer-based data and the current status of DSS use according to the developed framework. For this purpose, a selection of statements was given, which can be assigned to both the respective areas and levels of sophistication. The central part of the questionnaire was then divided into the various main areas of DSS use, as mentioned above. The participants were asked to select from different options on a 5-level Likert scale: If decisions are already supported by tools today, participants could choose either support by spreadsheets or by an actual DSS tool in use. The other two options, independent of an abstention option, assessed demand. By making participants choose between existing demand if a DSS tool would be helpful and non-existing demand if support by a tool is not deemed helpful, the current state of use and additional aspects of demand assessment were evaluated. All individual sub-areas were broken down, various decisions to be made were queried according to the decision matrix, and the assessment per decision area was made in order to differentiate between comprehensive systems for the entire organizational area and those that only represent a part of the process, i.e. expert systems as addressed in the market analysis.

In the next survey section, the tools and providers actually in use were covered by open questions in each area. For simplification and assistance, the participants were provided with tooltips, which showed examples such as system categories, tool names, or providers for each area. Open questions were chosen over a selection list, e.g. via drop-down, for various reasons: Most obviously, due to a large number of tools

on the market, as well as the dynamics and speed of the market itself, as well as the overlap between the functionalities and the categories, a drop-down list with default values would not only be not user-friendly but might also not be comprehensive or soon-to-be outdated. Besides, individual tools could quickly get lost in the comprehensive list. Secondly, open questions prevent confusion between tool and provider name. In many companies, especially for managers, actual tools are known under the provider name, but not under the product name, if at all. This solution allowed participants to enter the name they know, which was then mapped to the appropriate category. The possibility of an open question helped avoid the risk of suggestion and the risk of response bias. The survey aimed to determine which tools are actively used by managers to make decisions on a category and sophistication level rather than the actual vendor level. By not suggesting vendor and product names, the tools used for active decision support were queried rather than the tools used on other levels of for other activities within the company.

Finally, the general satisfaction with the market offer was investigated, as well as an assessment of the most essential aspects when selecting and implementing a new tool according to the data, analysis, and automation framework, followed by, lastly, demographic data. Those were related to the manager as an individual (age, education level, gender), the position (duration of the position, hierarchy level, regional responsibility) and the company as a whole (company turnover, industry, number of employees).

6.1.2. DESCRIPTIVE ANALYTICS

In total, 103 questionnaires were fully responded, equaling a response rate of 7,6 %; however, with a termination rate of 45%. The highest termination was right after the initial question. Given the gender imbalance in the sample set, it comes to no surprise that, when looking at the respondents' demographic profile, the rate of female to male respondents is strikingly low: While 91,26 % were male, only 9 out of 103 respondents were female (8,74%). 49,5 % [51][2] were between 45-54 years old, the lion's share (79,61 %, [82]) between 35 and 54 years old. Only 8,74 % were younger than 34 years, 11,7% were over 55 years old. Respondents were well-educated: 81,56% [84] hold a university degree, 6,8% [7] even a doctorate.

[2] round brackets indicate the relative frequency, while square brackets indicate the absolute frequency.

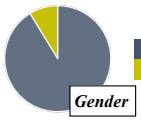
Most of them held their GMM position already for a while: With 2,95 % [3] new in their positions for less than 6 months, 11,76 % [12] in between 6-12 months, 14,71 % [15] held their position between 1-2 years. 70,6 % [72] held their position for more than 2 years already, which indicates the high familiarity and high sense of routine for their daily decisions. Despite the sample selection based on the job title to select GMM positions specifically, only 49 % [50] indicated themselves to be in MM positions, while 32,3 % [33] declared to be top-level executives and 18,63 % [19] stated to be First Line Managers. However, it is crucial to note that this information can be subject to biases, depending on the organizational hierarchy setup. Therefore, GMs might consider themselves Top Level managers of their division; however, organizationally are Middle Managers for the organization as a whole.

With regards to participating company profiles, industry allocation was widely distributed: Most respondents were operating in Wholesale and Retail trade (12,6 %), information and communication (15,5 %), manufacturing (21,4 %) and other services (12,6 %). Company sizes were also diversified, both in terms of turnover and the number of employees. Most companies (45,6 %) / [47] employ more than 1000 employees.

An overview of the demographic structure of respondents can be seen in Figure 1.

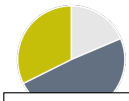
DESCRIPTIVE ANALYTICS

GMM DEMOGRAPHICS



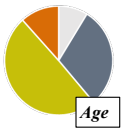
	Σ	%
male	94	91,26
female	9	8,74
	103	**100**

Gender



	Σ	%
First Line	19	18,63
Middle Management	50	49,02
Top Level	33	32,35
	103	**100**

Hierarchical level

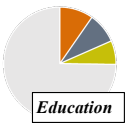


	Σ	%
25 - 34	9	8,74
35 - 44	31	30,10
45 - 54	51	49,51
55 +	12	11,65
	103	**100**

Age

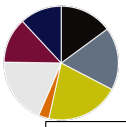
	Σ	%
< 6 months	3	2,94
6 – 12 months	12	11,76
1 – 2 years	15	14,71
2 years +	72	70,59
	102	**100**

Position holding time



	Σ	%
Abitur / Matura	10	9,71
Apprenticeship	9	8,74
Doctorate	7	6,80
University Degree	77	74,8
	103	**100**

Education



	Σ / %
AT	15
CEE	18
DACH	21
DACH & CEE	3
DE	19
Western Europe	13
Global	12
	101

Regional responsibility

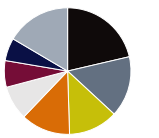
ORGANIZATIONAL DEMOGRAPHICS

	Σ / %
< 2 mil	4
2 – 10 mil	9
11 – 50 mil	18
50 – 1 bil	43
1 bil +	26
	100

Company turnover

	Σ	%
< 50	12	11,65
50 - 250	20	19,42
250 - 500	14	13,59
500 - 1000	10	9,71
> 1000	47	45,63
	103	**100**

Number of employees



	Σ	%
Manufacturing	22	21,36
Information and Communication	16	15,53
Other Services	13	12,62
Wholesail & Retail Trade	13	12,62
Health Care	9	8,74
Construction	7	6,80
Professional. Scientific and Technical Services	6	5,83
Others	17	16,5
	103	**100**

industry

Figure 1 - Descriptive Survey analytics

6.2. RESULTS

	supported through spreadsheets (e.g. Microsoft Excel) (1)		supported through a computerbased tool I am actively using (2)		not supported, but it would improve my managerial duty if they were. (3)		decision support through any IT system is not necessary. (4)		I don't know / I don't want to specify (0)		TOTAL	Ø	±	arithmetic mean (Ø) / standard deviation (±)
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%				
TOTAL AVERAGE		*29,8%*		*44,2%*		*12,1%*		*7,2%*		*7,0%*				
STRATEGY		***31,9%***		***46,1%***		***6,1%***		***4,4%***		***11,5%***				
Marketing (product, price, place, promotion)	42	40,8%	38	36,9%	7	6,8%	4	3,9%	12	11,7%	103	1,70	0,80	
Sales (e.g. Key Account Strategy, General Sales Strategy, etc.)	29	28,2%	61	59,2%	5	4,9%	4	3,9%	4	3,9%	103	1,84	0,70	
Operational strategy (for procurement, quality management, production, logistics)	25	24,3%	61	59,2%	3	2,9%	4	3,9%	10	9,7%	103	1,85	0,67	
Overall Business Strategy (Business planning or business model planning)	44	42,7%	33	32,0%	8	7,8%	4	3,9%	14	13,6%	103	1,69	0,82	
Financial planning	31	30,1%	53	51,5%	2	1,9%	1	1,0%	16	15,5%	103	1,69	0,58	
Human Resource (HR) Strategy	26	25,2%	39	37,9%	13	12,6%	10	9,7%	15	14,6%	103	2,08	0,95	
TACTICAL PLANNING		***37,4%***		***42,9%***		***6,2%***		***4,8%***		***8,7%***				
Marketing	38	37,6%	29	28,7%	9	8,9%	10	9,9%	15	14,9%	101	1,90	1,01	
Sales	34	34,0%	54	54,0%	7	7,0%	3	3,0%	2	2,0%	100	1,79	0,71	
Operations	30	29,7%	55	54,5%	3	3,0%	1	1,0%	12	11,9%	101	1,72	0,58	
Budgeting	49	48,5%	43	42,6%	3	3,0%	0	0,0%	6	5,9%	101	1,52	0,56	
Human Resources planning	37	37,0%	35	35,0%	9	9,0%	10	10,0%	9	9,0%	100	1,91	0,97	
REPORTING		***30,5%***		***52,2%***		***5,0%***		***3,0%***		***9,3%***				
Marketing	28	27,7%	42	41,6%	11	10,9%	7	6,9%	13	12,9%	101	1,97	0,88	
Sales	35	34,7%	59	58,4%	4	4,0%	1	1,0%	2	2,0%	101	1,71	0,59	
Operations	33	32,4%	55	53,9%	3	2,9%	1	1,0%	10	9,8%	102	1,70	0,59	
Financial Reporting	31	31,0%	56	56,0%	2	2,0%	0	0,0%	11	11,0%	100	1,67	0,52	
HR Reporting	27	27,0%	51	51,0%	5	5,0%	6	6,0%	11	11,0%	100	1,89	0,79	
OTHERS		***30,6%***		***39,1%***		***16,7%***		***9,3%***		***4,3%***				
Gaining business insights across departments	34	33,0%	45	43,7%	14	13,6%	5	4,9%	5	4,9%	103	1,90	0,83	
Personal task management (task priorization and scheduling)	26	25,2%	54	52,4%	13	12,6%	10	9,7%	0	0,0%	103	2,07	0,88	
Negotiating and supporting negotiations of all kind	29	29,0%	28	28,0%	22	22,0%	18	18,0%	3	3,0%	100	2,30	1,09	
Report outcomes to upper management	51	49,5%	44	42,7%	8	7,8%	0	0,0%	0	0,0%	103	1,58	0,63	
tactics)	31	30,1%	54	52,4%	7	6,8%	10	9,7%	1	1,0%	103	1,96	0,88	
Communication outside of the team and external	25	24,5%	40	39,2%	13	12,7%	18	17,6%	6	5,9%	102	2,25	1,05	
Collection of information within the organization	28	27,2%	57	55,3%	16	15,5%	1	1,0%	1	1,0%	103	1,90	0,68	
Definition of processes within the team and process optimization	25	24,8%	40	39,6%	28	27,7%	6	5,9%	2	2,0%	101	2,15	0,87	
Defend decisions in retrospect	43	41,7%	24	23,3%	12	11,7%	15	14,6%	9	8,7%	103	1,99	1,11	
Generic decision making through the assistance of decision-trees, statistical simulation, etc.	18	17,5%	20	19,4%	37	35,9%	11	10,7%	17	16,5%	103	2,48	0,97	
Selection and planning of projects to be implemented	35	34,0%	35	34,0%	18	17,5%	11	10,7%	4	3,9%	103	2,05	0,99	
MARKETING		***41,9%***		***33,2%***		***13,8%***		***4,1%***		***6,9%***				
Developing marketing programmes and measures from the predefined strategy	14	45,2%	11	35,5%	2	6,5%	1	3,2%	3	9,7%	31	1,64	0,78	
Market segment definition and target group analysis	11	35,5%	11	35,5%	3	9,7%	4	12,9%	2	6,5%	31	2,00	1,04	
Market demand and market size forecasting	15	48,4%	10	32,3%	3	9,7%	1	3,2%	2	6,5%	31	1,66	0,81	
Competitor analysis	16	51,6%	7	22,6%	6	19,4%	0	0,0%	2	6,5%	31	1,66	0,81	
Product planning, strategy and roadmapping	12	38,7%	13	41,9%	3	9,7%	1	3,2%	2	6,5%	31	1,76	0,79	
Marketing research (trend research, pattern analsis)	14	45,2%	5	16,1%	8	25,8%	2	6,5%	2	6,5%	31	7,93	1,03	
Marketing execution (campaign planning, target group selection, execution of measures)	9	29,0%	15	48,4%	5	16,1%	0	0,0%	2	6,5%	31	1,86	0,69	
SALES		***25,0%***		***62,5%***		***4,7%***		***2,3%***		***5,5%***				
Contract Life-Cycle Management	13	20,3%	36	56,3%	4	6,3%	2	3,1%	9	14,1%	64	1,91	0,67	
Quotation management (Pricing, Quotation setting, etc.)	16	25,0%	40	62,5%	5	7,8%	1	1,6%	2	3,1%	64	1,85	0,62	
Sales forecasting / Sales pipeline management	19	29,7%	44	68,8%	1	1,6%	0	0,0%	0	0,0%	64	1,72	0,49	
Sales employee Performance and Compensation Management	16	25,0%	40	62,5%	2	3,1%	3	4,7%	3	4,7%	64	1,87	0,69	
OPERATIONS		***21,7%***		***45,8%***		***21,7%***		***4,2%***		***6,7%***				
Production planning, execution and production planning optimization (e.g. capacity planning, cycle time reduction, yield management)	7	29,2%	13	54,2%	2	8,3%	0	0,0%	2	8,3%	24	1,77	0,61	
Quality management execution and optimization	5	20,8%	9	37,5%	7	29,2%	1	4,2%	2	8,3%	24	2,18	0,85	
Procurement execution and optimization	6	25,0%	14	58,3%	2	8,3%	1	4,2%	1	4,2%	24	1,91	0,73	
Logistics (e.g. distribution planning and optimization)	4	16,7%	11	45,8%	6	25,0%	1	4,2%	2	8,3%	24	2,18	0,80	
Process management and optimization (e.g. streamlining, identifying inefficiencies)	4	16,7%	8	33,3%	9	37,5%	2	8,3%	1	4,2%	24	2,39	0,89	
FINANCE														
Financial management (operational)	2	15,4%	11	84,6%						0	13	1,85	0,38	
HR		***17,8%***		***38,9%***		***15,5%***		***21,2%***		***6,5%***				
Employee deployment (e.g. task management, task allocation, task delegation)	25	24,5%	41	40,2%	14	13,7%	16	15,7%	6	5,9%	102	2,22	1,02	
Employee assessment, development and training	26	25,5%	61	59,8%	9	8,8%	3	2,9%	3	2,9%	102	1,89	0,68	
Leadership	19	18,6%	36	35,3%	17	16,7%	25	24,5%	5	4,9%	102	2,49	1,08	
Cultural definition and development (e.g. target profile definition, value definition)	15	14,7%	28	27,5%	24	23,5%	27	26,5%	8	7,8%	102	2,67	1,06	
Teambuilding	12	11,8%	18	17,6%	17	16,7%	46	45,1%	9	8,8%	102	3,04	1,10	
Talent management and candidate selection	12	11,8%	54	52,9%	14	13,7%	13	12,7%	9	8,8%	102	2,30	0,87	

Figure 2 - DSS Usage Results

Overall today, it can be said that Spreadsheet support still accounts for 29,8% in Decision support, a very high fragment, even though almost half (44,2%) use actual DSS software for support. For 12,1 %, DSS systems are not in use, but are acknowledged to improve managerial duty, still a considerably high number. As the level of spreadsheet and DSS support is considerably high in most categories, the remaining aspects can be split into active demand, lack thereof and abstentions. High additional tool demand for a certain category was assessed once the percentage was above 10% and, simultaneously, the negative demand, or the selected option for needlessness of said category did not outweigh the demand.

6.2.1. GENERIC DECISIONS

Several tools listed did not fall under the classification of DSS or were very specific and therefore dropped in the analysis. Also, some respondents replied with “intuition” or “consultants” when asked how their decisions are supported today, replies that also have been excluded from analysis. The total area of generic DSS tools show some of the highest levels of additional demand.

With regard to general decision support, there is demand for both negotiation support (22%) and general decision support. Especially the support by decision trees, statistical simulation and the like shows the highest demand level of 35.9%, and at the same time only a level of 17.5% for spreadsheet support and 19.4% for active DSS support.

To return to the decision-making framework for general management positions, the results can once again be broken down into interpersonal, strategic and information or operational decisions, while interpersonal decisions are primarily interrelated with HR.

Looking at the strategic and informational role, this mainly targets business planning and strategy definition. General business planning continues to be the area where spreadsheets are most widely used (42.7%), while it also has the lowest active DSS usage (32%). On the other hand, DSS is used mainly for sales and operational strategy (59.2% each), and financial planning (51.1%). The demand for strategic planning support tools is especially strong in HR (12.6%), almost twice as strong as in other strategic areas where the level is mediocre.

For operative decisions, before evaluating the functional split, it becomes apparent that tactical planning and budgeting is still mainly done through spreadsheets (48, 5 %). Compared to Strategic Planning, there is a higher use of spreadsheets and lower general DSS support (37.4% and 42.9% respectively), compared to 31.9% and 46.1%); however, the additional demand is at about the same level, so there are no clear trends in demand in this field. Especially for budgeting (48.5%) a high level of spreadsheet support is striking, while on the other hand the highest level of support from used DSS applications is for tactical sales and operations planning, a result that is also similar to strategic planning (54.0% and 54.5% respectively). The lowest functional DSS support is found in marketing (28.7%).

6.2.2. FUNCTIONAL

As described during the explanation of the structure of the survey, the functional areas were only answered by a share of respondents, do you to the branching in the survey. Therefore, the number of respondents in each functional area is lower than the total number, and distributed as follows: Whereas there are 31 respondents for the marketing area, sales was the most frequently selected area with 64 respondents, followed by operations with 24 and lastly finance with only 13 distinct responses. As it overlaps majorly with the intra-personal management role, the HR relevant aspects where displayed to all participants. The individual results for all of the areas are explained hereafter.

6.2.2.1. Marketing

Overall, the use of spreadsheets dominates the entire marketing segment with 41.9%, followed by 33.2% of DSS use. DSS are used mainly for product planning, strategy and road mapping (41.9%) and for marketing execution (48.4%), whereas marketing research is only supported to 16.1%.

However, with an average of 13.8%, DSS demand clearly outweighs the lack thereof of 4.1%. On the other hand, additional demand is highest in the areas of competitor analysis (19.4%), marketing research (25.8%), and marketing planning and execution (16.1%).

These results are consistent with industry findings, which show that 21% of companies still do not use marketing automation (regalix research, 2019), even though 35% of Austrian companies have an implementation planned (Internetworld AT, 2019).

6.2.2.2. Sales

Since Vlahos et al. (2004) stated some time ago that marketing and sales managers belong to the weakest user groups for DSS systems and through their use have the lowest value, GMMs in the sales area seem to have caught up significantly: Compared to all other departments, the support by DSS tools ranks highest (62.5%); even the spreadsheet use is significantly lower with an average of 25%. This is also associated with a notably low demand for additional support (4.7 %), especially for selling forecasts or pipeline management decisions (1.6 %).

6.2.2.3. Operations

Also for operations, only 24 respondents selected that they are specifically responsible, a very small number of participants in this area. The results show somewhat contrary to expectations that only 45.8% of all operations decisions are supported by DSS, spreadsheet support is even lower at 21.7%. There is still a high number of specific processes that show a high demand for additional support, which is mostly greater than the frequency of non-existent demand. These areas include, in particular, decisions relating to the execution and optimization of quality management (29.2%), logistics (25.0%) and finally process management and process optimization (37.5%).

6.2.2.4. Finance

To begin with, the small number of participants (only 13) in the financial sector must again be stressed. No demand for DSS was identifiable here; all participants use either spreadsheets (15.4 %) or DSS (84.6 %). These results nevertheless allow conclusions about the accuracy of the claim made by Vlahos et al.

(2004) that finance managers are the heaviest users of DSS and also benefit the most from its use (Vlahos et al., 2004)

6.2.2.5. Human resources

HR shows the lowest overall percentage of support through spreadsheets, at 17.8%. Especially talent management and candidate selection (52.9%), employee deployment (40.2%) or employee assessment and training (59.8%) are already supported by DSS tools.

Even though the demand in almost all areas except employee assessment, development and training is above 10%, the lack of demand is consistently higher. This becomes particularly clear for teambuilding: While currently only 17.6% are supported by DSS and the demand is 16.7%, a full 45.1% of the participants stated that DSS support is not necessary. Only in the area of talent management is demand somewhat ahead. The overall average of unnecessary support of 21.2% exceeds the additional support requirement of 15.5%.

6.2.3. ANALYTICS

More than half of the GMMs use DSS for reporting (52.2%). In all areas except marketing, the proportion is over 50%. The majority of remainders (37.4%) use spreadsheets, a share which is as high as 50% for reporting to senior management.

Due to the low marketing use of DSS, the demand for additional support is particularly high (10.9%). In sales, the highest level of both spreadsheet (34.7%) and DSS support (58.4%) is recorded with little additional demand (4.0%).

6.2.4. TOOL AND VENDOR USE

Mentioned tools were evaluated and compared to supply analysis and mapped according to the same framework. If they had not been analyzed previously, they were added as separate tools. Others, even though mentioned in the survey, were excluded from analysis, as they are rather general IT applications. Spreadsheet tools were, howeve still predominantly mentioned, not surprisingly as Reporting tools (31),

Area	Tool Category	COUNT	DATA	ANALYTICS	AUTOMATION	SCORE
Finance			2,9	1,6	2,3	3,8
	ERP	6	3,0	1,3	2,2	3,5
	BI	1	3,0	2,0	2,0	4,0
General Leadership			2,4	1,9	2,1	3,4
	HCM	29	2,2	2,4	2,2	3,9
	ERP	14	3,0	1,3	2,0	3,3
	BI	3	3,0	2,0	2,3	4,3
	CRM	2	2,0	2,5	2,5	4,0
Marketing			2,3	2,3	2,7	4,3
	CRM	6	2,0	3,0	3,0	5,0
	ERP	5	3,0	1,0	2,0	3,0
	Multi-Channel Marketing	4	2,0	3,0	3,0	5,0
Operations			2,8	1,9	2,4	4,0
	ERP	8	3,0	1,1	1,9	3,0
	BI	7	3,0	2,6	2,9	5,4
Others			2,0	1,6	2,0	2,7
	ERP	6	3,0	1,0	2,0	3,0
	CRM	4	2,0	2,7	2,7	4,3
	BI	3	3,0	2,3	2,7	5,0
	Project Management	3	1,0	0,7	2,0	0,7
	Statistical Analysis	3	1,0	2,3	1,0	1,3
	Generic DSS	2	1,0	1,0	1,0	0,0
Reporting			2,7	2,1	2,6	4,4
	BI	36	3,0	2,5	2,8	5,3
	ERP	31	3,0	1,5	2,2	3,6
	CRM	19	2,2	2,9	2,9	5,1
	Project Management	4	1,0	0,7	2,0	0,7
Sales			2,4	2,3	2,6	4,3
	CRM	30	2,0	3,0	3,0	4,9
	ERP	15	2,9	1,3	2,0	3,2
	BI	9	3,0	2,4	2,8	5,2
Strategic & Tactical			2,5	2,1	2,5	4,1
	ERP	30	3,0	1,2	2,0	3,2
	CRM	24	2,0	3,0	3,0	4,9
	BI	19	3,0	2,5	2,8	5,3
	HCM	8	2,5	2,6	2,3	4,4
	Project Management	4	1,0	0,0	2,0	0,0
TOTAL			**2,5**	**2,1**	**2,4**	**4,0**

Table 5 - tool and vendor use

Strategic & Tactical (28) or sales-relevant (20). They were, however, excluded from analysis, as they were already analyzed in the previous section. Also left out were document management tools, most frequently mentioned for strategic & tactical assistance (14) and reporting (12) purposes, as well as general leadership (12). Lastly, collaboration tools, self-programmed or industry-specific tools were excluded, As well as external data providers, especially for general market data.

Tool categories that were mentioned just less than four times, were excluded due to statistical insignificance. The average DSS application used scores 2,5 on data; 2,1 on analytics and 2,4 on automation. This shows a lack of analytical capabilities used in many organizations today, with the database component already being strongly pronounced. Similar to the results of the market analysis, BI systems in particular stand out due to their high degree of sophistication. They play a significant role for reporting but are also used in many other areas. HCM systems are frequently mentioned, especially for decision support in the general leadership area, a result that is somewhat surprising, since HCM systems are not among the pioneers and the HR area often lags behind the others. As expected, CRM systems play a role in sales-related decisions, but also play a leading role in strategic & tactical decisions and reporting. Somewhat surprisingly come the low mentions of ERP systems in the operations area. ERP systems are even more often mentioned for sales decisions, or in reporting, than for operations decisions. However, it is noteworthy that especially in terms of data, the ERP systems used are much more advanced than the entire market offer. Similarly, in the finance area, few tools and especially none of the tools from the market offer are mentioned, but here too the small

number of participants for finance must be taken into account. It is noticeable that neither detached FP&A nor financial management systems are mentioned, but often these are only components from ERP. Generic DSS systems are extremely underrepresented and hardly ever mentioned, which may also be related to their low maturity. BI, ERP and CRM systems are used for strategic planning. In summary, it can be seen that companies using a DSS often use very advanced tools but also, that only the main categories from different areas are mentioned. fractional areas or minor DSS categories seem to to me used to a significant extent among GMMs. On average, tools with a general score of 4 or higher are used in most areas. Only for general leadership, and other general decisions, the score is low to medium.

6.2.5. SITUATION ANALYSIS AND MARKET SATISFACTION

At the beginning of the survey, participants were asked to give an estimation on the share of computer-based data, compared to gut-feeling and experience. Looking at 97 answers on this question, the estimated percentage of computer-based data ranges from 7 % to 92%, with a mean of 55,47 %. In other words, decisions for GMMs today are not marginally more than half-based on data provided by any IT system. Despite all technological progress and technical possibilities provided, managers rely on instinct and gut feeling almost as much as on data provided.

Apart from this subjective estimate score, an organizations current status according to the DSS framework was evaluated. Respondents were asked to select from a series of nine statements the ones which most accurately describe their current situation. Each of these statements was fit to one of the categories, as well as to a level of low, medium or high. Selection Frequencies can be seen in table 6. The results show, that across all categories, analytical aspects have the strongest emphasis with a total of 52,1 %, followed by database functions (36,9%). It is striking, that automation aspects only account for 7,3 % of how decisions are made today. Looking in more detail, within the data-based field, a high, complete and combined dataset is important, with the highest percentage of 44,7% mentioned in the field of data, which does not come surprising. Additionally, while analytics seems to be the most essential element for DSS, this fact is mainly

distributed to KPI calculation (73,8%) and visual analytics (64,1 %). Actual advanced analytics (18,4 %) lags behind both other aspects.

CURRENT STATUS	minimum importance (1)		TOTAL
	Σ	%	
DATA		**36,9%**	
Low: manual data entry	34	33,0%	103
Medium: data collection	34	33,0%	103
High: data combination	46	44,7%	103
ANALYTICS		**52,1%**	
Low: KPI calculation	76	73,8%	103
Medium: visual analytics	66	64,1%	103
High: advanced analytics	19	18,4%	103
AUTOMATION		**7,1%**	
Low: worflow recommendations	6	5,8%	103
Medium: automated workflows	14	13,6%	103
High: AI / ML	2	1,9%	103

Table 6 - Survey Results - current status

Regarding automation, High automation functionalities using AI or ML capabilities are hardly used for actual decision support by GMM with only 1,9%. When talking about automation, actual automated workflows (13,6 %) beat workflow recommendations (5,8 %), however still only show a moderate level.

However, as can be seen in table 7, when selecting a new DSS, results are different. High Automation capabilities through ML or AI seem to be more relevant for new tools than they are currently, however are still considerably low. The most important aspect when selecting a new tool remains analytics. However, with visual analytics predominantly used today, for newly selected tools, advanced analytics functionalities are most important (23, 2 %).

DSS SELECTION ASPECTS	minimum importance (1)		(2)		(3)		(4)		(5)		(6)		(7)		maximum importance (8)		TOTAL	Ø	±
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%			
DATA		**17,2%**		**14,1%**		**11,6%**		**12,6%**		**16,2%**		**8,6%**		**8,6%**		**11,1%**			
Medium: data collection	14	14,1%	16	16,2%	12	12,1%	11	11,1%	23	23,2%	8	8,1%	8	8,1%	7	7,1%	99	4,05	2,12
High: data combination	20	20,2%	12	12,1%	11	11,1%	14	14,1%	9	9,1%	9	9,1%	9	9,1%	15	15,2%	99	4,19	2,48
ANALYTICS		**8,8%**		**12,1%**		**11,4%**		**11,8%**		**9,4%**		**14,8%**		**16,2%**		**15,5%**			
Low: KPI calculation	18	18,2%	13	13,1%	11	11,1%	9	9,1%	11	11,1%	7	7,1%	10	10,1%	20	20,2%	99	4,44	2,58
Medium: visual analytics	3	3,0%	14	14,1%	13	13,1%	12	12,1%	12	12,1%	22	22,2%	20	20,2%	3	3,0%	99	4,79	1,92
High: advanced analytics	5	5,1%	9	9,1%	10	10,1%	14	14,1%	5	5,1%	15	15,2%	18	18,2%	23	23,2%	99	5,39	2,24
AUTOMATION		**13,1%**		**11,8%**		**14,1%**		**13,1%**		**13,1%**		**12,8%**		**11,4%**		**10,4%**			
Low: worflow recommendations	7	7,1%	13	13,1%	18	18,2%	19	19,2%	10	10,1%	10	10,1%	19	19,2%	3	3,0%	99	4,34	2,00
Medium: automated workflows	5	5,1%	8	8,1%	13	13,1%	12	12,1%	20	20,2%	17	17,2%	11	11,1%	13	13,1%	99	4,96	2,00
High: AI / ML	27	27,3%	14	14,1%	11	11,1%	8	8,1%	9	9,1%	11	11,1%	4	4,0%	15	15,2%	99	3,83	2,55

Table 7 - Survey Results - DSS Selection aspects

Finally, in terms of overall market satisfaction, as can be seen in Table 8, most GMM are either mostly (35, 2 %) or very satisfied (8,6 %) with the market offering of DSS tools, even though it has to be mentioned that abstentions on this question were very high. Even more so, across different areas, there are no striking areas where GMMs show a high rate of dissatisfaction, only slight discrepancies can be observed.

DSS MARKET SATISFACTION	very dissatisfied (1)		mostly dissatisfied (2)		N/A (3)		mostly satisfied (4)		very satisfied (5)		TOTAL	Ø	±	arithmetic mean (Ø) / standard deviation (±)
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%				
TOTAL AVERAGE		***3,0%***		***17,5%***		***22,6%***		***35,2%***		***8,6%***				
Sales	2	2,0%	22	21,8%	16	15,5%	49	48,5%	14	13,9%	103	3,50	1,05	
Marketing	1	1,0%	19	18,8%	40	38,8%	40	39,6%	3	3,0%	103	3,25	0,83	
Operations	3	3,0%	22	22,0%	28	27,2%	40	40,0%	10	10,0%	103	3,32	1,02	
Personal Planning / Generic	6	5,9%	25	24,5%	17	16,5%	40	39,2%	15	14,7%	103	3,32	1,17	
HR	6	5,9%	15	14,9%	31	30,1%	41	40,6%	10	9,9%	103	3,34	1,04	
General leadership amd management tools	3	3,0%	21	20,8%	31	30,1%	39	38,6%	9	8,9%	103	3,30	1,00	

Table 8 - Survey Results - market satisfaction

7. DISCUSSION

As has been explained in the previous chapter, only the main tools are in fact used. Fractional tools all throughout different functional departments only play a minor role. As can be seen in table 9, which compares the sophistication levels from the market analysis and the actual demand, almost all tools in use score considerably higher than the Market average. The only exception to this is ERP systems, which is unexpected when one recalls that ERP systems are often considered as the backbone of organizational IT infrastructures. A possible explanation may be that ERP systems are mainly used for operational processes and offer little data for management decisions. This can also be seen in the results, if one takes into account the fact that ERP systems often fail in their analysis functions and are therefore often used in combination with data warehouses or BI systems to compensate for this weakness. At the same time, it is possible that because ERP systems are among the most long-established systems in use, release and update cycles are long and therefore many systems are not at the forefront of innovation.

Especially the functional tools in use score significantly above the market standard; generic tools are below the standard, but also on the supply side show a low grade of maturity anyway and are obviously rarely used. In summary, the following conclusion can be drawn: When a DSS system is in use, it is in most cases

state of the art, above the industry average. If, however, no system is in use and there is no demand for an advanced DSS, Excel is often sufficient to support the decision-making process.

		DEMAND				SUPPLY			
Area	**Tool Category**	**DATA**	**ANALYTICS**	**AUTOMATION**	**SCORE**	**DATA**	**ANALYTICS**	**AUTOMATION**	**SCORE**
Generic									
	Project Management*	1,0	0,4	2,0	**0,4**	1,0	0,7	2,0	**0,7**
	Generic DSS*	1,0	1,0	1,0	**0,0**	1,1	1,7	1,6	**1,5**
Functional: Sales									
	CRM	2,1	2,9	2,9	**4,9**	2,1	2,5	2,6	**3,6**
Functional: Marketing									
	MMH*	2,0	3,0	3,0	**5,0**	2,0	2,8	3,0	**4,5**
Functional: Operations									
	ERP	3,0	1,3	2,1	**3,4**	2,7	2,4	2,4	**4,5**
Functional: HR / Interpersonal									
	HCM	2,3	2,5	2,3	**4,1**	2,0	2,1	2,2	**3,3**
Analytics									
	BI	3,0	2,5	2,8	**5,2**	2,8	2,6	2,7	**5,1**

* low mentions

Table 9 - DSS Category Use vs. Supply

Table 10 displays the evaluated decision processes throughout the different areas, as well as the identified supply and demand in a simplified manner. This helps understand, where mismatches between additional supply and demand occur.

GENERIC	**INTERPERSONAL**	**STRATEGIC & INFORMATIONAL**	**OPERATIVE**	
	• Personal administration and time management (Supply: low, demand: high)	• Generic decision making (supply: low, demand: high) • Strategy definition and implementation (Supply: medium; demand: low)	• Negotiations (supply: low; demand:high) • Operational supervision • Project management (supply: low, demand: low)	
	MARKETING	**SALES**	**OPERATIONS**	**HUMAN RESOURCES**
FUNCTIONAL	- Supply: high demand: high	• Supply: medium, demand: low	• Supply: high demand: high)	• Supply: medium demand: high
ANALYSIS	Reporting: Supply: High, demand: low			

Table 10 - Supply and Demand Mapping per decision area

Results can be broadly divided into three categories: Firstly, when supply outweighs demand, secondly when supply equals the level of demand and thirdly, when demand outweighs supply. The first and third categories explain market mismatches, that can occur from different reasons.

The first exists for strategic & business planning tools, as well as for sales and reporting tools. Completely missing in this area is business model design, which, similar to strategy definition, is usually located in upper management - and thus largely excluded from the scope of this paper - but often there is overlap in the functional area of GMM. Similar to negotiations, business model design is hardly a linear process and therefore not yet included in DSS offerings (Daas et al., 2013), hardly any strategic tool offers business model capabilities, also e.g. through integration with external market data providers. Perhaps this could be an aspect to further increase the attractiveness of strategic tools for GMM and to increase the benefits. At the same time, the level of additional demand for sales is low, a fact that is related to the fact that CRM already shows a high level of usage. The same applies to reporting, where it can also be assumed that the low level of additional demand is caused by the already existing high level of DSS coverage.

Throughout the functional areas, demand predominantly equals supply, even though slight differences across the different departments can be seen. To put it in a nutshell, functional results show, that there is a high demand for tools that cover a broad range of processes, tools that only provide support for a fragment of business areas, are outdated and show low demand. Existing fractional tools are threatened because of their very low attractiveness for GMMs. They are only relevant if they offer sufficient integrative capabilities to transfer their findings to more holistic tools such as BI and then focus on their operational process part. Some of those fractional tools are however more sophisticated than central applications, as the process specialization has allowed vendors to invest in technical maturity. Examples for this can be found mainly in the area of process optimization, but also for marketing. While these are technically advanced and show a high level of maturity, the demand is also very high. One possible explanation incudes misinformation of GMMS about market supply and application and technological availability.

Demand is also predominant in the HR sector. Since HR-related software use is often mentioned last, it can be predicted that some companies will invest here in the coming years. Market analysis has shown that

HCM tools should focus more on all 3 aspects of data, analytics and automation, to keep up with other areas and system categories.

Looking at the third category, which describes a market surplus of demand, it is existing mainly for generic management decisions. Especially for personal administration, generic decision making or negotiation support, the demand is extraordinarily higher than the market supply. As has been shown, DSS to support generic management shows major sophistication lacks, especially in terms of data integration, but also in terms of automation. Available tools might thus not be attractive for GMM use. For generic DSS, the number of available software is high, but holistic, integrative application is almost nonexistent.

7.1. LIMITATIONS AND SUGGESTION FOR FURTHER RESEARCH

The study carried out presents some limitations, both in terms of market analysis and survey.

First of all, the supply analysis is mainly based on public marketing data or information published on a vendor's website. This procedure is based on the assumption that underlying technical features and functionalities are advertised comprehensively, truthfully and holistically. However, it must be considered that such advertising information is subject and only the strongest features are advertised. It can be assumed in principle that, especially, all aspects regarding an applications' technological advancement, including the ability to integrate the data or advanced analysis capabilities, are publicly provided, as they represent an essential capability of the instrument itself. Nevertheless, tool capabilities were neither objectively examined nor tested for their truthfulness, as this would have gone beyond the scope of this research.

Although the participants were carefully selected beforehand executing the online survey, a high fraction of participants described themselves as belonging to upper management rather than mid-level management. Selection bias in the preselection can therefore not be ruled out entirely. However, it is important to note that this information can be distorted depending on the structure of the organizational hierarchy. Caused by overconfidence, it is important to consider the possibility that the subjective perception of hierarchy does not correspond to the objective one, and that consequently, a bias results. Put simply, a GM might consider himself a top-level manager of a department or region, but organizationally they are

middle managers for the organization as a whole. Moreover, the organizational structure is very much individual for each company. In order to be able to work out individual differences between the company levels indicated, the answers were compared per level, and some discrepancies were found. The slightest discrepancies were found for generic decisions, but there were also strong differences in the strategic definition, objectives and functional areas. However, this is also connected with the low number of participants for some functional departments, which prevents an accurate and valid statement on level differences from being made. A further split once again reduces the number of participants and thus the informative value of the results. For future research in this area it is therefore recommended that these results be validated in order to reduce the probability of selection bias. For example, the objective allocation in the company hierarchy could be compared with the subjective assessment in the GMM area to exclude biases. In this way, more could be found out about the actual hierarchical use of the individual systems. All of this is also related to the fact that, due to the branching within the survey, some functional parts of the survey had very few respondents. This leads to the conclusion that managers, even if they are not officially and functionally responsible for a fixed enterprise area, still oversee it in the matrix organization. Here, too, it is recommended for future research that a larger study be set up in order to be able to draw generally valid conclusions with a higher number of participants, especially for functional decisions.

Moreover, it has been noticed that self-developed tools play an important role next to open tools on the market. A deeper insight in a further study would make it possible to evaluate these tools with the developed classification in order to check whether they can keep up with the average market offer, under which circumstances they cannot do so or what adds value for GMMs. The same applies to industry-specific tools, such as those from the construction industry, where such applications were most frequently mentioned.

7.2. MANAGERIAL IMPLICATIONS

The findings from this work help two different sides in practice: On the one hand GMMs, on the other hand the providers of DSS tools and their product managers.

Firstly, and most importantly, it has been shown that the topic has a high practical relevance for managers. By providing a detailed overview over market supply for DSS and BI tools on the German, Austrian and CEE Market, managers can use it as a basis to choose a particular system. It sheds light on technical concepts, terms, capabilities and demarcations and explains to GMMs the current market offer helps them understand which tools can support which decisions. In this way, the translational language gap between business and IT can be reduced.

It also shows relevant aspects for DSS and exposes important components for DSS-supported decision-making. Findings underline the importance of integrative data management and comprehensive information collection in order to be able to recognize realistic connections and get holistic insights. The demand analysis helps GMMs to understand where they themselves are compared to the overall average and to identify possible backlogs in their decision- making concept or even technological concept.

Secondly, results will add to further understand how managers use the current system offerings and make suggestions to fill in possible gaps on either supply or demand side. This may help vendors understand manager demand and give an idea on how to not only technically, but also conceptually improve system offerings.

8. CONCLUSION

Several years ago, the future of DSS research was in critical condition. Scientists have claimed that the relevance of DSS research has come to an end, making DSS a 'dead' field of research (Arnott and Pervan, 2008). Hosack et al. (2012) opposed this stating that DSS research is "alive and well" and has simply undergone great development, resulting in consistent, if not even growing pertinence. This research shows that DSS is now as relevant as ever, not only in research, but also in practice. With all topics surrounding digital transformation and increasing automation in the company, the DSS field has become indispensable. The focus has shifted from experts in a certain area or for a certain decision towards a more integrative and holistic approach, whilst exploiting all aspects of technical innovation.

Wit BI Systems having the highest fit for GMMs, it will be relevant to observe how this aspect will progress in the future. Because despite high AI and ML capabilities for most BIs, most systems are focused on analysis and thus on delivering results. As a matter of principle, the boundaries between the previously fixed corporate divisions are merging into a uniform overview. However, it must be noted that a large amount of information and data also provides a greater target for biases. The survey conducted has shown that intuition, managerial experience and gut feeling persist to be highly relevant for managers. And as long as humans are involved, data and insights are subject to human bias. Because more data also does not automatically mean more insight. Information overload and big data can become more hindering than helping, if insights are not ensured. Integrated thinking is needed to prevent data and insight silos. Decision making can be distorted by intuition, interpretation bias or overconfidence (Accenture Strategy, 2016). Just as with all these insights, managers must remain aware, that with increased data analysis that the decision maker himself can sometimes become a source of error rather than the data provided.

With this thought in mind, managers must begin to exhaust the options for decision support. It should be understood that a DSS tool does not repress or even replace the GMM task and position, as the human component remains essential in this area. Furthermore, the use of DSS has long ceased to be a matter for IT. Managers must increasingly and actively deal with the possibilities and tools that can be used instead of letting IT take the lead. Only in this way can the full potential of the technological possibilities be exploited, not only to improve the quality and objectivity of their own decisions, but also to remain competitive in the long term.

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APPENDIX

SUPPLIER ANALYSIS DATA

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
1	**1000Minds**		https://www.1000minds.com/	1	1	1	**0**	Generic DSS	Generic		Prioritization Conjoint analysis Value analysis Group Decision Making Multi-Criteria-Decision-Analysis manual entry selection of preferences visual overview
2	**Acquia**	Agil One	https://www.acquia.com/de/products-services/acquia-agilone	2	3	3	**5**	Multichannel Marketing	Marketing	Marketing Data predictive capabilities and advanced analytics deep ML	customer insights multi-channel marketing
3	**Acumatica**	Acumatica Financial Management suite	https://www.acumatica.com/	3	3	3	**6**	ERP Financial Management CRM	Operations Finance Sales		financial management accounting CRM Standard functionality service and customer portal project accounting integrative broad database integrated, flexible workflows visual and flexible automatics AI and ML functionalities visual and advanced reporting
4	**affinity**	Affinity alliances	www.affinity.co	2	2	3	**4**	Relationship Management	Generic	automated data generation contact-focused data automated suggestions	relationship insights contact analysis
5	**airfocus**		https://airfocus.com	1	2	2	**2**	Project Management Collaborative DSS	Generic	project-focused task list visual dashboards automated prioritization	product strategy management team collaboration
6	**Allovance**	Allovance	https://allovance.com/	1	2	2	**2**	generic DSS	Generic	manual entry visual scorecard prioritization and objective suggestions	decision guidance collaborative decision making
7	**Alteryx**		https://www.alteryx.com/de	3	2	2	**4**	BI	Analytics	integrative database advanced automation seamless workflows	collaborative decision making analytics automation
8	**Anaplan**		https://www.anaplan.com/de/	3	3	3	**6**	Financial Planning & Analytics	Finance	integrative cross-departmental database options algorithm based advanced analytics AI capabilities	business planning financial management forecasting scenario planning performance management
9	**AppsFlyer**		https://www.appsflyer.com	2	2	2	**3**	Department Analytics	Marketing	customer / marketing-centric data visual dashboard	

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
10	**Asacorp**	Decision Builder	https://www.asacorp.com/decisionbuilder.jsp?tc=true	1	3	2	**3**	generic DSS	Generic	manual decision process modeling predictive modeling automation capabilities	statistical analysis decision tree analysis automated workflow rules
11	**Aspect**		https://www.aspect.com/de	2	2	3	**4**	Workforce Management	HR	Service Center Data visual Dashboards AI Functionality	
12	**balanced scorecards**	QuickScore	https://balancedscorecards.com	3	2	2	**4**	Performance Management Business Planning & strategy Management	Generic	company performance data visual dashboards threshold-based workflows	Strategic Planning strategy tracking
13	**BambooHR**		https://www.bamboohr.com/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards no high-class automation	Hiring support onboarding compensation management employee self-service cultural development
14	**Banxia Software**	Decision Explorer	https://banxia.com/	1	2	1	**1**	generic DSS	Generic	predictive analytics	efficiency analytics qualitative model analysis brainstorming
15	**Behavox**		https://www.behavox.com/	3	3	3	**6**	BI	Analytics	integrated database advanced analytics machine learning	CRM-based analytics Business Insights
16	**BOARD International**		https://www.board.com	3	3	2	**5**	Financial Planning & Analytics BI	Finance Analytics	holistic cross-department database advanced analytics simulation automation	business planning collaborative planning modeling profitability analysis performance reporting financial close
17	**Bryter**		https://bryter.io/	1	2	2	**2**	Generic DSS	Generic		Decision tree analysis automated workflows
18	**CCH Tagetik**		https://www.tagetik.com	3	3	2	**5**	Financial Planning & Analytics	Finance	holistic cross-department database advanced analytics simulation automation	Budgeting forecasting financial planning performance reporting dashboards modeling financial close
19	**celonis**		https://www.celonis.com/	3	3	3	**6**	Process Management	Generic	holistic cross-department database advanced analytics AI Automation	process mining workforce optimization
20	**Cheetah Digital**		https://www.cheetahdigital.com/	2	3	3	**5**	Multichannel Marketing	Marketing	Marketing-centric data advanced analytics integrated ML models	customer data management customer loyalty management

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21	**Clarabridge**		http://www.clarabridge.com/	3	3	3	**6**	BI	Analytics	Customer-centric data BI Addon Text Mining NLP AI	text mining Data Mining
22	**Cloudera**		http://www.cloudera.com/	3	3	3	**6**	BI	Analytics	integrated database AI capabilities augmented analytics	data management analytics
23	**cobra**		https://www.cobra.de/	2	2	2	**3**	CRM	Sales Marketing	sales- and marketing-centric data visual dashboards flexible workflows	Customer Management Sales Functionalities Marketing capabilities document tmanagement
24	**Cogentus**	Smart Decisions	https://www.cogentus.co.uk/products-sd	1	2	2	**2**	Generic DSS	Generic	manual entry visual dashboards threshold-based automation	Options Value Tree Weighting Scoring Visual Dashboards Value Mapping Root Cause Analysis
25	**Cohesity**		https://www.cohesity.com/de/	3	2	2	**4**	BI	Analytics	holistic, integrated data visual analytics flexible automation engine	data warehouse
26	**Collectivei**	Collectivei	https://www.collectivei.com/what-is-collectivei/	2	3	3	**5**	CRM	Sales	sales-centric database predictive analytics AI capabilities	ERM (Enterprise Revenue Management) CRM forecasting collaboration
27	**Cooladata**		https://www.cooladata.com/	2	3	3	**5**	Department Analytics	Marketing	customer-journey centric data advanced analytics NLP ML capabilities	data warehouse customer journey analytics analytics customer segmentation
28	**Copper**		https://www.copper.com/	2	2	1	**2**	CRM	Sales	Sales-based data visual dashboards simple workflows	Customer Management Contact Management Pipeline Management
29	**cornerstone**		https://www.cornerstoneondemand.de/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards no high-class automation	talent management learning platform HR Suite Performance Management
30	**D-Sight**	Project Portfolio Optimization Collaborative Decision Making Strategic Sourcing Analysis	http://www.d-sight.com/solutions	1	2	2	**2**	generic DSS	Generic	manual entry visual dashboards automated workflows	project prioritization visual analysis collaborative decision-making
31	**Databricks**		https://databricks.com/de/	3	3	3	**6**	BI	Analytics	integrated database predictive analytics ML capabilities	Data warehouse analytics
32	**Decision Lens**		https://www.decisionlens.com/	3	3	2	**5**	generic DSS Business Planning & strategy Management	Generic	holistic, integrated database advanced analytics scenario planning	budget planning strategic decision support

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33	**Decision Optimizer**		https://dextroanalytics.com	2	2	3	**4**	BI	Analytics		simulation what-if scenarios alternative mapping Ai-driven signal and trend finder
34	**Decisions**		https://decisions.com/	1	2	2	**2**	generic DSS Decision Management Application	Generic	manual data entry decision visualization visual analysis business and workflow automation	automated workflow rules decision trees definition of business rules
35	**degreed**		https://degreed.com/	1	2	2	**2**	Learning Management and Learning Experience	HR	manual, Skill-centric-database visual analytics skill-based workflows	employee learning platform
36	**Dimensional Insight**		http://www.dimins.com/	3	2	2	**4**	BI	Analytics	integrated database KPI calculation visual dashboards automated workflows	data warehousing KPI calculation analytics
37	**docebo**		https://www.docebo.com/de/	1	2	3	**3**	Learning Management and Learning Experience	HR	manual, Skill-centric-database visual dashboards AI-capabilities	employee learning platform
38	**Emarsys**		https://emarsys.com/de/	2	2	3	**4**	Multichannel Marketing	Marketing	marketing-centric data visual dashboards AI capabilities	Marketing Automation Personalization E-Mail Web Mobile Marketing Analytics Loyalty Management Data Platform
39	**Episerver**	Digital Experience Cloud	https://www.episerver.de	2	2	3	**4**	Multichannel Marketing	Marketing		Campaign Management Content Management E-Commerce Marketing-centric database visual analytics ML capabilities
40	**Evergage**		https://www.evergage.com/	2	2	3	**4**	Multichannel Marketing	Marketing	marketing-centric data visual dashboards AI capabilities	E-Commerce Segmentation demand-generation content publishing Personalization
41	**Expert Choice**		http://www.expertchoice.com/	1	1	2	**1**	generic DSS	Generic	spreadsheet based reporting flexible workflows	portfolio Management project prioritization resource allocation budget planning
42	**Facilitate.com**		http://www.facilitate.com/	1	2	2	**2**	Generic DSS	Generic	manual decision process modeling predictive modeling automation capabilities	idea tracking brainstorming prioritization

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
43	**Fico**	Decision Management Suite	https://www.fico.com/en/products/fico-decision-management-suite	3	3	3	**6**	Generic DSS Decision Management Application	Generic	integrated database possibilities advanced analytics AI	Data Management Platform decision making support decision modeling
44	**FinanceIsland**		http://financeisland.com/	2	1	1	**1**	generic DSS Finance	Finance	finance-centric data simple statistical analysis los automation	Monte Carlo Simulation financial analysis ROI analysis cash flow analysis statistical analysis
45	**Financial Force**		https://www.financialforce.com/	2	2	2	**3**	ERP	Finance Operations	integrated database possible mainly limited to customer and finance data visual dashboards flexible workflows	Fulfillment Billing & Receivables Procurement Accounting & Finance Analytics
46	**flowlity**		https://flowlity.com/	2	2	3	**4**	Supply Chain Management	Operations	Supply-chain based data visual dashboards AI based algorithms	inventory management supply chain planning external supply chain connection
47	**fourkites**		https://www.fourkites.com/	2	3	3	**5**	Supply Chain Management	Operations	supply-chain-centric database advanced analytics ML Capabilities	network collaboration arrival management analytics supply chain orchestration
48	**Freshworks**		https://www.freshworks.com	2	2	3	**4**	CRM	Sales	sales-centered data visual dashboards AI Capabilities	Helpdesk Lead Management Pipeline Management Customer Management
49	**Frontline Systems**		http://www.solver.com	1	1	1	**0**	BI	Analytics	spreadsheet based analytics simulation and modeling	excel models monte carlo simulation decision tables risk analysis
50	**Gem**	previously: Zensourcer	https://www.gem.com/	2	2	2	**3**	Talent Management	HR	talent-centric data visual dashboards automated workflows	candidate relationship management
51	**GoldenSim Technology Group**		https://www.goldsim.com/	1	2	1	**1**	Generic DSS	Generic	manual entry statistical analysis simulation	Monte Carlo Simulation
52	**Greenplum**		https://greenplum.org/	3	3	3	**6**	BI	Analytics	integrated database AI / ML capabilities augmented analytics	Data warehouse analytics
53	**GridRank**		https://www.gridrankit.com	1	2	2	**2**	Generic DSS	Generic	manual entry visual dashboard simple workflows	Group decision making decision ranking prioritizations
54	**Grovo**		https://www.grovo.com/	1	2	2	**2**	Learning Management and Learning Experience	HR	manual, Skill-centric-database visual analytics skill-based workflows	employee learning platform

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55	**Hubspot**		https://www.hubspot.com/	2	2	2	**3**	Marketing Automation CRM	Marketing Sales	customer-centric data visual analytics rule-based automation	Contact Data Pipline Management Content Management Marketing automation Customer Service Hub
56	**IBM**	Cognos Cloud	https://www.ibm.com/products/software	3	3	3	**6**	BI	Analytics	integrated database advanced analytics machine learning	self-service analytics ML-based modeling
57	**IBM**	Planning Analytics		3	3	3	**6**	Financial Planning & Analytics	Finance	integrated database advanced analytics AI capabilities	financial planning forecasting budgeting
58	**acoustic**		https://acoustic.com/	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictive analytics AI capabilities	personalization campaign execution analytics content management lifecycle management
59	**icertis**		https://www.icertis.com/	2	3	3	**5**	Contract Management	Sales	contract-centric data AI application predictive analytics	negotiation contract management
60	**Informatica**		http://www.informatica.com	3	3	3	**6**	BI	Analytics	Integrated database predicitve Analytics AI-insights	data integration business insights data warehousing data management
61	**Information Builders**	WebFOCUS	https://www.informationbuilders.com/	3	3	3	**6**	BI	Analytics	integrated database NLP, ML and AI capabilities augmented analytics	Data Analysis
62	**Intelsoft**	Style Intelligence	https://www.inetsoft.com/	3	2	3	**5**	BI	Analytics		Visual Analysis Machine Learning Interactive Analytics Data Warehousing
63	**Glickon**		https://www.glickon.com/en	2	3	3	**5**	HCM	HR	HR-centric data advanced analytics KI / ML capabilities	Talentmanagement Employee Experience Management People Analytics
64	**Tibco**	Jaspersoft	http://www.jaspersoft.com/	2	2	2	**3**	BI	Analytics	integrated database visual analytics flexible customization	data visualization data mining
65	**Jedox**		https://www.jedox.com/de/	3	2	2	**4**	Financial Planning & Analytics / BI	Finance	integrated database visual dashboards flexible workflows	financial planning budgeting and forecasting financial controlling
66	**Kepion**		https://www.kepion.com/	3	2	2	**4**	Financial Planning & Analytics	Finance	integrated database visual dashboards flexible workflows	financial planning operational planning scenario analysis
67	**Kinaxis**		https://www.kinaxis.com	2	2	3	**4**	Supply Chain Management	Operations	Supply-chain based data visual dashboards AI based algorithms	Supply Chain optimazation scenario planning project management

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
68	**Kinexon**		https://kinexon.com/de	2	2	3	**4**	Supply Chain Management	Operations	Supply-chain based data visual dashboards AI based algorithms	Material Flow Management paperless production tool management
69	**Klaviyo**		https://www.klaviyo.com/	2	3	2	**4**	Multichannel Marketing	Marketing	marketing-centric data predictive analytics automation	E-Commerce Segmentation Customer Behavior Tracking Personalization
70	**Kognitio**		http://www.kognitio.com/	3	3	3	**6**	BI	Analytics	integrated database KPI calculation visual dashboards automated workflows	Data Warehousing Big Data Analytics
71	**Kustomer**		https://www.kustomer.com/	2	3	3	**5**	CRM	Sales	sales-centric database visual dashboards AI capabilities	Customer Service Management
72	**Lattice**		www.lattice.com	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards flexible workflows	performance management goal setting feedback reviews employee experience
73	**LeanDNA**		https://www.leandna.com/	2	3	3	**5**	Department Analytics	Operations	combined ERP Data NLP functionality predictive analytics advanced AI	proactive task recommendation factory analytics inventory management
74	**Lessonly**		https://www.lessonly.com/	1	2	2	**2**	Learning Management and Learning Experience	HR	manual, Skill-centric-database visual analytics skill-based workflows	employee learning platform
75	**Listrak**		https://www.listrak.com/	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictive analytics AI / ML capabilities	cross-channel campaign orchestration Personalization revenue optimization customer profile management module analytics
76	**Logic Programming Associates**	VisiRule	http://www.lpa.co.uk/vsr.htm	1	1	1	**0**	Generic DSS	Generic		rule-based simple workflows decision tree setup manual data entry no analysis logic
77	**LogicNets**		https://logicnets.com/	1	2	3	**3**	Generic DSS	Generic	manual data entry visual dashboards automated workflows	decision tree visualization automated workflow modeling
78	**Loomio**		https://www.loomio.org/	1	0	1	**-1**	generic DSS	Generic	manual data entry unstructured data only simple workflows	collaborative decision making
79	**Lumina Decisions**		https://lumina.com/	1	2	2	**2**	Generic DSS	Generic	manual decision process modeling visual dashboard flexible workflows	visual modeling quantitative decision modeling

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
80	**Magnitude**	RapidDecision	https://magnitude.com/	3	2	2	**4**	BI	Analytics	integrated database visual analytics flexible customization	Data warehouse analytics
81	**MakeItRational**		http://makeitrational.com/tutorials	1	2	1	**1**	generic DSS	Generic	manual entry visual dashboard simple workflows	project prioritization
82	**Marketo**		https://de.marketo.com/	2	3	3	**5**	Multichannel-Marketing CRM	Marketing	marketing-centric data predictive analytics AI capabilities	Marketing Automation E-Mail Mobile Social Web Marketing Analytics Customer Engagement
83	**Ment.io**		https://www.ment.io/	2	2	3	**4**	Generic DSS	Generic	communication-data visual dashboard simple workflows	collaborative Decision making
84	**Microsoft**	business central Dynamics ERP previously: Navision	https://dynamics.microsoft.com/de-de/business-central/overview/	3	2	2	**4**	ERP	Operations	integrated database visual dashboards flexible workflows	finance- and accounting support supply-chain management sales forecast project management
85	**Microsoft**	Dynamics - CRM	https://dynamics.microsoft.com/de-de/	2	3	3	**5**	CRM	Sales	sales-centric data predictive analytics AI capabilities	pipeline management quote and order management contract management activity management
86	**Microsoft**	Excel	https://www.microsoft.com/de-at/microsoft-365/excel	1	2	2	**2**	Spreadsheet	Generic	Manual Data entry or combination statistical analysis and visual reporting basic rule-based automation can be programmed as a Macro	Spreadsheet Statistical analysis visual reporting threshold-based workflows
87	**MicroStrategy**		http://www.microstrategy.com/	3	3	3	**6**	BI	Analytics	integrated database advanced analytics AI capabilities	data warehousing analytics
88	**Midrig**	Evaluator	http://midrig.com/	1	1	1	**0**	generic DSS	Generic		weighted criteria analysis Scorecards collaborative decision making reporting
89	**mimica**		https://mimica.ai/	3	3	3	**6**	Process Management	Generic	holistic cross-department database advanced analytics AI / ML Automation	weighted criteria analysis Scorecards collaborative decision making reporting
90	**Mixpanel**		https://mixpanel.com	2	3	2	**4**	BI	Analytics	product-related data advanced analytics	Behavioral analytics messaging user analytics product analytics
91	**Monday.com**		https://monday.com/lang/de/	1	2	2	**2**	Team Management Personal Management	Generic	manual data (unstructured) lvisual dashboards flexible workflows	project planning task planning collabortion

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92	**OneStream Software**		https://www.onestreamsoftware.com/	3	2	2	**4**	Financial Planning & Analytics	Finance	integrated database visual dashboards flexible automation	financial close financial planning budgeting and forecasting performance reporting
93	**Opentext**	Analytics	http://www.actuate.com/	3	3	3	**6**	BI	Analytics	cross-department data text mining advanced analytics AI technology	Data mining
94	**OpenText**	Customer Experience Management	https://www.opentext.com/	2	3	3	**5**	Customer Experience Employee Experience	Marketing	marketing- and sales- centric data text mining advanced analytics AI technology	Customer Communication Digital Asset Management Marketing Optimization Experience Analytics Web Content Management Workforce Optimization
95	**Optimove**		https://www.optimove.com/	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictice analytics AI Capabilities	customer insights multi-channel marketing optimization segmentation customer journey analytics attribution
96	**Oracle**	Crystal Ball	https://www.oracle.com/applications/crystalball/	1	1	1	**0**	Generic DSS	Generic	spreadsheet-based data statistical analysis monte carlo simulation	Risk and uncertainty evaluation
97	**Oracle**	SCM Cloud		2	3	2	**4**	Supply Chain Management	Operations	supply-chain-centric data advanced analytics AI / ML capabilities	supply chain planning Warehouse management manufacturing maintenance order management logistics product lifecycle management produrement
98	**Oracle**	HCM Cloud	https://www.oracle.com/de/applications/human-capital-management/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards flexible workflows	Budgeting time management talent management HR service Workforce Management self-service
99	**osiopt**		http://www.osiopt.com/	2	3	3	**5**	Supply Chain Management	Operations	supply-chain-centric database advanced analytics ML Capabilities	supply chain optimazation operations planning prescriptive analytics simulation
100	**Outreach**		https://www.bamboohr.com/	2	2	2	**3**	HCM	HR	HR-centric data KPI and visual dashboards basic automation	
101	**Palisade**	DecisionTools Suite	https://www.palisade.com/	1	1	1	**0**	Generic DSS	Generic		based on excel spreadsheets monte carlo simulations What if analysis statistical analysis

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102	**Paramount Decisions**		https://paramountdecisions.com/	1	2	2	**2**	generic DSS project management	Generic	manual entry visual dashboards automated workflows	collaborative decision making feedback project management
103	**Parmenides Eidos**	Eidos	https://www.parmenides-eidos.com/eidos9/us/	1	2	1	**1**	generic DSS	Generic	manual entry visual dashboard simple workflows	modeling scenario planning visual analytics problem solving management techniques
104	**peakon**		www.peakon.com	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards flexible workflows	employee engagement employee experience leadership development
105	**Pegasystems**		https://www.pega.com/de	2	3	3	**5**	Generic DSS Decision Management Application	Marketing Sales	customer-focused database predictive analysis KI-based decision modeling	customer decision hub decision management CRM process automation campaign optimization
106	**People.ai**		https://people.ai/	2	2	3	**4**	CRM	Sales	sales-central data visual dashboard AI and ML capabilities	Customer and Contact Management Relationship Management Pipeline Management Activity Management Campaign Management
107	**Perdoo**		https://www.perdoo.com/	1	2	2	**2**	Business Planning & strategy Management	Generic	manual entry visual dashboard simple workflows	strategic goal setting communication collaboration
108	**Pipedrive**		https://www.pipedrive.com/de	2	2	2	**3**	CRM	Sales	sales-based data visual dashboards flexible workflows	lead management customer communication tracking pipeline management
109	**Planful**		https://planful.com/	3	2	2	**4**	Financial Planning & Analytics	Finance	integrated database KPI calculation visual dashboards automated workflows	Budgeting forecasting financial planning performance reporting dashboards modeling financial close
110	**Planhat**		https://www.planhat.com/	2	2	2	**3**	BI	Analytics	customer-centric data visual dashboards flexible automation	Customer Data Platform Customer Lifecycle Management
111	**PoPin**	Pop In now	http://popinnow.com/	1	1	1	**0**	Generic DSS	Generic	manual entry unstructured data with low analytical functionality collaboration > automation	Live Polls collaborative decision crowdsource ideas (idea and innovation management)
112	**Powernoodle**		https://www.powernoodle.com/	1	2	2	**2**	Generic DSS	Generic	manual entry visual dashboard simple workflows	Data Analysis KPIs

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113	**Unit4**	FP&A	https://www.unit4.com/	3	3	3	**6**	Financial Planning & Analytics	Finance	integrated database advanced analytics AI / ML capabilities	financial planning budgeting and forecasting financial controlling performance management people planning & analytics
114	**Prime Dash**	Prime Dash	https://primedash.com/	2	2	2	**3**	Financial Management	Finance	focus on finance data visual dashboards decision simulation	Reporting budgeting financial modeling Simulation of Financial Decisions
115	**Microsoft**	Power BI	https://powerbi.microsoft.com/de-de/	3	2	3	**5**	BI	Analytics	integrated database visual dashboards AI / ML capabilities	self-service analytics ML-based modeling
116	**Progress**	Corticon Enterprise	https://www.progress.com/corticon/components	3	2	2	**4**	BI	Analytics	holistic, integrated database decision modeling tool flexible automization workflows	data mining modeling
117	**Unit4**	ERP	https://www.unit4.com/	3	3	3	**6**	ERP	Operations	integrated database advanced analytics AI / ML capabilities	financial management project management procurement management HR & payroll field service management
118	**Unit4**	HCM	https://www.unit4.com/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards basic workflows	employee experience payroll management talent management learning recruitment performance management
119	**Prophix**		https://www.prophix.com/de/zuhause/	1	2	2	**2**	Financial Planning & Analytics	Finance	spreadsheet based visual dashboards flexible workflows	Budgeting forecasting financial planning performance reporting workflow modeling
120	**Pymetrics**		https://www.pymetrics.ai/	2	2	3	**4**	HCM	HR	HR-centric data visual dashboards AI capabilities	talent management
121	**Qlik**	Qlik View	https://www.qlik.com	3	3	3	**6**	BI	Analytics	integrated database visual dashboards ML capabilities	analytics
122	**qualtrics**	Customer Experience	https://www.qualtrics.com/de/	2	3	3	**5**	CRM	Sales	sales-centric data predictive analytics AI capabilities	
123	**qualtrics**	Employee Experience	https://www.qualtrics.com/de/	2	3	3	**5**	HCM	HR	HR-centric data predictive analytics KI capabilities	employee experience management feedback employee development training onboarding

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
124	**QuickScore**	Balanced Scorecard	https://balancedscorecards.com/	1	2	2	**2**	Business Planning & strategy Management	Generic	manual entry visual dashboards flexible workflows	
125	**Rapid Modeling**	Simulation Modeling	https://www.rapidmodeling.com/simulation-modeling-software	1	1	1	**0**	Generic DSS	Generic	manual entry statistical analysis simulation	Decision Tree Analysis Monte Carlo Simulation Statistical Analysis Decision Tree Setups Spreadsheet Analysis Linear Programming Value Stream Mapping Deterministic Modeling v. Queuing Theory vi. Discrete Event Simulation statistical analysis
126	**RedPoint Global**	One	https://www.redpointglobal.com/	2	3	3	**5**	Multichannel Marketing	Marketing		AI and Machine Learning Campaign Execution Integration Capabilities predicitive analytics
127	**Resulticks**		https://www.resulticks.com/	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictice analytics ML / AI - capabilities	Omnichanne Marketing E-Mail Mobile Push Social Dynamic Offer Management Segmentation decision making
128	**Riskturn**		https://www.riskturn.com/	1	2	1	**1**	generic DSS	Generic	manual entry statistical analysis simulation	Business planning modeling what-if-analysis
129	**River Logic**		http://www.riverlogic.com	3	3	3	**6**	BI	Analytics	integrative, holistic database predictive analytics scenario planning	analytics what-if scenario planning capacity planning production planning product mix and customer profitability sales & operations planning procurement supply chain optimization
130	**Sailthru**		https://www.sailthru.com/	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictice analytics ML / AI - capabilities	Personalization
131	**Salesforce**			2	3	3	**5**	CRM	Sales	sales-centric data predictive analytics AI capabilities	contact management opportunity management lead management marketing autpmation
132	**Salesforce**			2	3	3	**5**	Multichannel Marketing	Marketing	marketing- (&sales)- centric predictive analytics AI capabilities	customer journey management campaign execution

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
133	**SAP**	Sales Cloud	https://www.sap.com/austria/products/crm/sales.html	2	3	3	**5**	CRM	Sales	sales-centric data predictive analytics AI capabilities	pipeline management quote and order management contract management activity management
134	**SAP**	Integrated Business Planning	https://www.sap.com/products/integrated-business-planning.html	2	0	2	**1**	Supply Chain Management	Operations	supply-chain-centric data analytics only in combination with BI system flexible workflows	supply chain planning Warehouse management manufacturing maintenance order management logistics product lifecycle management produrement
135	**SAP**	Success Factors	https://www.sap.com/austria/products/human-resources-hcm.html	2	3	3	**5**	HCM	HR	HR-centric data predictive analytics KI capabilities	employee experience management talent management employee development training time management onboarding
136	**SAP**	SAP Analytics Cloud		3	3	3	**6**	Financial Planning & Analytics	Finance	integrated database advanced analytics AI / ML capabilities	financial planning budgeting and forecasting financial controlling performance management people planning & analytics
137	**SAP**	Marketing Cloud	https://www.sap.com/austria/products/crm/marketing.html	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictive analytics ML / AI capabilities	automated campaign management personalization segmentation
138	**SAS**		http://www.sas.com	3	3	3	**6**	BI	Analytics	integrated database advanced analytics AI / ML capabilities	analytics
139	**SAS**	Customer Intelligence 360	https://www.sas.com/de_at/software/customer-intelligence-360.html	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data advanced analytics AI capabilities	Resource management customer journey management marketing orchestration
140	**Segment**		https://segment.com/	2	2	2	**3**	Department Analytics	Marketing	mainly marketing-centric data warehousing	automated data collection customer journey analytics
141	**Selligent Marketing Cloud**		https://www.selligent.com	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data advanced analytics AI, ML and NLP capabilities	omnichannel execution Customer experience management Personalization behavioral targeting channel optimization
142	**Sitecore**		https://www.sitecore.com	2	3	3	**5**	Multichannel Marketing	Marketing	marketing-centric data predictive modeling AI capabilities	Customer Experience Management Content Management e-commerce personalization
143	**Sprinkl**		https://www.sprinklr.com/de/	2	3	3	**5**	Multichannel Marketing CRM	Marketing	marketing-centric data predictive analytics AI capabilities	

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
144	**Statgraphics**	Statgraphics	https://www.statgraphics.com/	1	2	1	**1**	Statistical Analysis	Analytics		Data visualization data mining
145	**sumtotal**		https://www.sumtotalsystems.com/de/	2	2	2	**3**	HCM	HR	HR-centric database visual analytics skill-based workflows	talent management learning platform Workforce Management Performance Management
146	**Syncopation**	DLP	https://www.syncopation.com	1	2	2	**2**	generic DSS	Generic	manual entry, spreadsheet based visual dashboard simulation	decision modeling monte carlo simulations
147	**Tableau Software**		http://www.tableausoftware.com/	3	3	3	**6**	BI	Analytics	advanced analytics AI / ML capabilities	analytics
148	**Talentsoft**		https://www.talentsoft.de/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards basic automation	talent management learning compensation management employee planning self-service
149	**Teradata**		http://www.teradata.com	3	3	3	**6**	BI	Analytics	integrated database advanced analytics AI / ML capabilities	analytics
150	**ThoughtSpot**		https://www.thoughtspot.com/de	3	3	3	**6**	BI	Analytics	integrated database advanced analytics AI / ML capabilities NLP capabilities	analytics
151	**Tibco**	Spotfire	http://www.tibco.com	3	3	3	**6**	BI Decision Management Application	Analytics	integrated database advanced analytics AI capabilities	data mining
152	**TransparentChoice**	Project Prioritizer	https://www.transparentchoice.com/	1	2	2	**2**	Project Management	Generic	manual entry visual dashboards flexible workflows	project management strategy execution prioritization
153	**Ultimate software**		https://www.ultimatesoftware.com/	2	3	3	**5**	HCM	HR	HR-centric database predicitve analytics AI capabilities	payroll manegement talent management time management scheduling HR services
154	**Vanguard System**		https://www.vanguardsw.com	3	3	3	**6**	Business Planning & strategy Management	Generic	integrated database predictive planning AI / ML capabilities	risk management predicitve planning collaboration monte carlo simulations
155	**Vena Solutions**		https://venasolutions.com/	2	2	2	**3**	Financial Planning & Analytics	Finance	finance-centric data visual dashboards simple automation scenario analysis	Budgeting forecasting financial planning revenue planning financial modeling

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
156	**Vortarus**	Simulation Master	https://vortarus.com/products/simulation-master-monte-carlo-simulation/	1	1	2	**1**	Generic DSS	Generic	manual entry spreadsheet data statistical analysis (monte carlo simulation)	Excel Add-In for Monte Carlo Simulations
157	**Workday**	Workday	https://www.workday.com/	3	3	2	**5**	HCM Financial Management	HR Finance	combined HR- & Finance Database Story Analytics, NLP (no ML or AI algorithms in place)	Personnel requirements planning team building by electing employees according to talent, skills and job profiles managerial workforce overview
158	**Workday**	Workday Financial Management	https://www.workday.com/	3	3	2	**5**	Financial Management Financial Planning & Analytics	Finance		business planning financial management (strong roadmap for AI/ML but limited functionality in current release)
159	**Workiva**		https://www.workiva.com	1	2	2	**2**	Financial Planning & Analytics	Finance	spreadsheet based visual dashboards basic automation	performance reporting budgeting financial planning
160	**Yonyx**		https://corp.yonyx.com/	1	2	1	**1**	Generic DSS	Generic	manual entry visual dashboard simple workflows	decision tree decision model
161	**Zingtree**		https://zingtree.com	1	2	1	**1**	generic DSS	Generic	manual entry visual dashboard simple workflows	decision tree decision model
162	**Infor**	Birst	http://www.infor.com/	3	3	3	**6**	BI	Analytics	integrated database advanced analytics AI / ML capabilities	
163	**Infor**	CloudSuite CRM	http://www.infor.com/	2	2	2	**3**	CRM	Sales	sales-centric data visual dashboards flexible workflows	lead management pipeline management activity management
164	**Infor**	Cloudsuite HCM	http://www.infor.com/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards flexible workflows	Budgeting time management talent management HR service Workforce Management self-service
165	**Shibumi**		https://shibumi.com/	1	2	2	**2**	Business Planning & strategy Management	Generic	manual entry visual dashboards flexible workflows	Strategy planning strategy execution strategy tracking project management
166	**Capsifi**	Jalapeno	https://www.capsifi.com/	1	2	2	**2**	Business Planning & strategy Management	Generic	manual entry visual dashboards flexible workflows	strategy planning businsess analysis decision modeling project management business planning
167	**i-nexus**		https://i-nexus.com/	1	2	2	**2**	Business Planning & strategy Management	Generic	manual entry visual dashboards flexible workflows	Strategy planning strategy execution strategy tracking

ID	VENDOR	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
168	**SAP**	Data Cloud	https://www.sap.com/austria/products/analytics.html	3	3	3	**6**	BI	Analytics	integrated database advanced analytics AI / ML capabilities	analytics
169	**SAP**	S/4 HANA		3	3	3	**6**	ERP	Operations	integrated database predictive analytics AI capabilities	finance support supply-chain and procurement management production management sales forecasting
170	**Smartsettle**	Resolution Cloud	https://resolutioncloud.io	1	1	1	0	Negotiation Support	Generic	manual entry no statistical analysis low automation	

ADDITIONAL EVALUATED DEMAND TOOLS

ID	VENDOR	DEMAND	SOFTWARE NAME (if different from vendor name)	WEBSITE	DATA	ANALYTICS	AUTOMATION	TOTAL SCORE	TOOL CATEGORY	FUNCTIONAL AREA	SCORING COMMENTS	FUNCTIONALITIES
1	**Abas**	X		https://abas-erp.com/de	3	2	1	**3**	ERP CRM	Operations Sales Finance		CRM Procurement Production Planning Field Service Materials Management Financial accounting bookkeeping business intelligence analytics financial management project management Combined Database Visual Analytics no automation specification
2	**Adobe**	**X**	Experience Cloud		2	3	3	**5**	Multichannel Marketing	Marketing		marketing-centric database predictive analytics AI / ML capabilities
3	**Advantage Customs**	X	ATLAS	https://www.dbh.de/zollsoftware/	2	0	2	**1**	Customs software	Operations	customs-centric data focus on planning rather than reporting automized workflows	Logistics Customs
4	**Applaud**	X		https://www.applaudhr.com/	2	0	2	**1**	Workforce Management	HR	HR-centered database automated workflows	employee administration feedback process employee self-service
5	**Appraisd**	X		https://www.appraisd.com/	1	2	2	**2**	Performance management	HR	manual, unstructured data visual dashboards basic custom workflows	team collaboration
6	**Asana**	X		https://asana.com	1	0	2	**0**	Project Management	Generic	manual data entry (rather unstructured than structured data) overview, no statistical analysis automated prioritization	collaboration task planning task allocation project management
7	**Atlassian**	X	JIRA	https://www.atlassian.com/software/jira	1	0	2	**0**	Project Management Planning	Generic	manual entry no statistical analysis flexible workflows	project planning task tracking collaboration
8	**Atlassian**	X	Confluence	https://www.atlassian.com/software/confluence	0	0	0	**-3**	Document collaboration	Generic	no structured data no analytics no workflows	document storage collaboration
9	**ATOSS**	X		https://www.atoss.com/	2	2	2	**3**	Workforce Management	HR	HR-centric data visual dashboards flexible workflows	time management employee allogcation capacity planning self-service

10	**Babteq**	X		https://www.babtec.de/	2	2	2	**3**	Quality Management	Operations	QM-centric data no reporting functionality info no automation info	Failure Mode and Effects analysis inspection planning audit management complaing management action management planning risk analysis
11	**CargoWise**	X		https://www.cargowise.com/	2	2	2	**3**	Supply Chain Management	Operations	supply-chain-centric database visual dashboards basic workflows	Supply Chain Planning Logistics
12	**Cascade**	X		https://www.executestrategy.net/	3	2	2	**4**	Business Planning & strategy Management	Generic	integrated strategy data KPI calculation visual dashboards automated tracking features through integration	collaboration strategy planning portfolio management strategy execution and tracking
13	**Clari**	X		https://www.clari.com	2	3	3	**5**	CRM	Sales	sales data predictive insights AI capabilities	sales forecasting opportunity management pipeline management
14	**Clear Review**	X		https://www.clearreview.com/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards basic workflows	Employee Engagement performance management
15	**Logitheque**	X	Figgo	https://www.logitheque.com/de/pro/figgo-59665	1	1	1	**0**	Time Management	HR	Time data manual entry low analytics low automation	Time Management
16	**Google Analytics**	X		https://marketingplatform.google.com/intl/de/about/analytics/	2	3	3	**5**	Website Tracking	Marketing	Website-centric data advanced analytics ML capabilities	
17	**Gradar**	X		https://www.gradar.com/de/	2	2	2	**3**	HCM	HR	HR-centric data visual workflows basic automation	Job evaluation Competence Management Job architecture Benchmarking Compensation structuring
18	**Greenhouse**	X		https://www.greenhouse.io/	2	2	1	**2**	Talent Management	HR	Talent-centric data visual dashboards simple automation	Recruiting Process Onboarding
19	**HR Core**	X		https://www.corehr.com/	2	2	2	**3**	HCM	HR	HR-centric data visual workflows basic automation	People Management Workforce Management Payroll Recruitment Talent Management
20	**Intuo**	X		https://intuo.io/	2	2	2	**3**	HCM	HR	HR-centric data visual workflows basic automation	Talent Management Performance Learning Management
21	**IRI**	X		https://www.iriworldwide.com	2	3	3	**5**	Department Analytics	Marketing	marketing analytics advanced analytics AI Capabilities	martketing analytics market performance analytics marketing strategy
22	**?**	X	Mindmap		1	1	1	**0**	Generic DSS	Generic		

23	**miro**	X		https://miro.com	1	1	1	**0**	generic DSS	Generic	manual data (unstructured) low to none analytics low to none workflows	mind mapping collaboration decision visualization whiteboard idea generation
24	**Microsoft**	X	Access	https://www.microsoft.com/de-at/microsoft-365	1	1	1	**0**	Statistical Analysis	Analytics	spreadsheet based data statistical analysis	
25	**Microsoft**	X	My Analytics	https://www.microsoft.com/de-de/microsoft-365/business/myanalytics-personal-analytics	2	2	2	**3**	Personal Management	Generic	personal data visual dashboards flexible workflows	efficiency data work pattern tracking
26	**myHR**	X		https://www.myhr.co.nz/	2	2	2	**3**	HCM	HR	HR-centric data KPI and visual dashboards basic automation	Recruitment Performance Reviews Restructuring Self-Service On- and Offboarding
27	**OnePont**	X		https://www.onepoint-projects.com/en	1	2	2	**2**	Project Management	Generic	manual entry visual dashboards scenario planning	new product development project management portfolio management
28	**Oracle**	**X**	Oracle CX Cloud	https://www.oracle.com/de/applications/customer-experience/	2	3	3	**5**	Multichannel Marketing CRM	Marketing Sales	marketing- & Sales-based data predictive analytics AI capabilities	multi-channel marketing sales planning commerce functionality customer service functionality
29	**Oracle**	X	Peoplesoft	https://www.oracle.com/de/applications/peoplesoft/	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards flexible workflows	
30	**People HR**	X		https://www.peoplehr.com/	2	2	2	**3**	HCM	HR	hr-data visual dashboards automated decision proposals	talent management performance management applicant tracking "employee essentials"
31	**Perbit**	X		https://www.perbit.com/	2	2	2	**3**	HCM	HR	HR-centric data KPIs and visual dashboards basic workflows	employee management talent management time management self-service
32	**Personal Dialog**	X		https://www.datadialog.de	2	1	2	**2**	HCM	HR	HR-centric data	Recruiting Training Temporary employment
33	**Personio**	X		https://www.personio.de	2	2	2	**3**	HCM	HR	HR-centric data KPIs and visual dashboards basic workflows	Recruiting HR administration Feedback and Performance Reviews
34	**Planview**	X		https://www.planview.com	3	2	2	**4**	Business Planning & strategy Management	Generic	integrated database visual dashboards flexible automation	Portfolio Management Work Management Strategy Enterprise Planning
35	**Precision (Transport Management)**	X	part of QAD (see below)	https://www.precisionsoftware.com/	2	3	3	**5**	ERP	Operations	production-and supply-chain centric data predicitive analytics AI / ML capabilities	Supply Chain Management Production Logistics Transport Management
36	**Pyramid**	X		https://www.pyramidanalytics.com	3	2	3	**5**	BI	Analytics	integrated database visual dashboards ML capabilities	analytics

37	**QAD ERP**	X		https://www.qad.com/de-DE/	2	3	3	**5**	ERP	Operations	production-and supply-chain centric data predicitive analytics AI / ML capabilities	Supply Chain Management Production
38	**R**	X		https://www.r-project.org/	1	3	1	**2**	Statistical Analysis	Analytics		
39	**Rexx**	X		https://www.rexx-systems.com	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards basic automation	Recruiting Talent Management HR Processes
40	**SAP**	**X**	SAP Data Warehouse and analytics solutions: Business Objects Business Warehouse Business Information Bex Analyzer	https://www.sap.com/austria/products/bi-platform.html	3	2	2	**4**	BI	Analytics	integrated database visual analytics	strategy management
41	**SAP**	**X**	SAP (ERP)		3	1	2	**3**	ERP	Operations	integrated database low analytics simple workflows	finance support supply-chain and procurement management production management sales forecasting
42	**IBM**	**X**	SPSS	http://www.spss.com/	1	3	1	**2**	statistical analysis	Analytics	predictive analytics	
43	**Super-Office**	X		https://www.superoffice.de/	2	2	2	**3**	CRM	Sales	sales-centric data visual dashboards automated workflows	Customer Management Task Management Collaboration project management selection
44	**SABA**	X	Talent-Link	https://www.saba.com/de	2	2	2	**3**	HCM	HR	HR-centric data visual dashboards flexible workflows	talent management learning performance management recruiting employee planning self-service
45	**TeamWorks**	X		https://www.teamwork.com	1	2	2	**2**	Project Management	Generic	manual data visual dashboards simple automation	Task Management Collaboration Project Planning
46	**Xactly**	X		https://www.xactlycorp.com/	2	2	2	**3**	Sales Performance Management	Sales	Sales-centric data visual dashboards basic automation workflows	Sales Planning and Execution Territory Management
47	**Isgus**	X	Zeus	https://www.isgus.de/loesungen/zeiterfassung/	2	0	2	**1**	Time Management	HR	automated data collection basic automated workflows overview but lack of analysis	Employee Assignment Time Management
48	**SAP**	**X**	Business Planning and Consolidation	https://www.sap.com/austria/products/bpc.html	3	0	2	**2**	Financial Planning & Analytics	Finance	integrated database analytics only in combination with BI system flexible workflows	financial planning forecasting budgeting

49	**Sage**	**X**	ERP	https://www.sage.com/	3	2	2	**4**	ERP	Operations	integrated database visual dashboards flexible workflows	finance support project management Supply Chain Management Production Logistics Transport Management
50	Hitachi Ventara	**X**	Pentaho	https://www.hitachivantara.com/en-us/products/data-management-analytics/pentaho-platform.html?source=pentaho-redirect	3	2	2	**4**	BI	Analytics	integrated database visual analytics flexible customization	data integration business analytics visual analytics
51	ServiceNow	**X**										
52	**Oracle**	**X**	Netsuite	https://www.netsuite.com/portal/home.shtml	3	3	3	**6**	ERP CRM FP&A	Operations Sales Finance	integrated database predictive analytics AI capabilities	resource planning CRM reporting BI capabilities HCM capabilities

SURVEY ENGLISH

Decision Support in General Management

Page 1

Firstly, Thank you very much for your time in these troubling days.

The goal of this study is to evaluate your managerial decision making as well as the tools that support to do so. The focus is not on which IT tools are used throughout your company, but on finding out which of them provide you with data to support your decisions.

This survey will take about 5-10 minutes of your time.
Optionally, you can register to receive the results of this study after its completion. Simply enter your e-mail address at the end of this survey.

Thank you very much for your time and assistance.

Stay safe and healthy!

Lisa Zepmeisel
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1. Which functional areas do you oversee?

- [ ] Marketing
- [ ] Sales
- [ ] Accounting
- [ ] Research and Development
- [ ] Corporate Administration
- [ ] Finance
- [ ] Operations / Manufacturing
- [ ] Others (please specify) _____

2. Your decisions are based on your gut feeling and leadership experience as well as on computer-based data. How high would you estimate the share of computer-based data?

purely gut-feeling based (0 % computer-based data) — purely computer information based

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3. Please select the statements below that describe best how your decisions are based on data today. Please select a maximum of 3 statements.

- [ ] I am relying on my predefined KPIS which are calculated and use simple statistical analysis to evaluate business data.
- [ ] I make my decisions based on advanced automation functionalities such as Artificial intelligence or machine learning.
- [ ] I am relying mainly on data based on specific department performance.
- [ ] I am relying on data that has been combined from multiple departments into one report to get a clear overall picture of our performance.
- [ ] I make decisions mainly on calculated automation, which is based on fixed thresholds for certain KPIs.
- [ ] I am relying on automated workflows based on predefined rules to give estimations for recurring situations and decisions.
- [ ] I rely on visual analytics like dashboards or scorecards to evaluate our business performance.
- [ ] I am relying on the use of advanced analytics, such as predictive or prescriptive analytics for indications about future situations and to get deeper insights on our data.
- [ ] I am relying on reports with data that was entered manually to have control over our structured business data.

Generic Decisions

As a decision maker in your position, you may use both information provided by IT tools as well as non-computer based information to support your decisions.

Regarding the tools described below, which ones are you currently actively using for decision support, which ones would you consider helpful for managers in your position or would assess for usage and which ones would you not consider using to support your decisions?

4. Strategic definition and implementation

This question refers to the process of defining strategy, or direction, and making decisions on allocating its resources to pursue this strategy in the long term.

Decisions in this area are

	supported through spreadsheets (e.g. Microsoft Excel)	supported through a computer-based tool I am actively using	not supported, but it would improve my managerial duty if they were.	decision support through any IT system is not necessary.	I don't know / I don't want to specify
Marketing (product, price, place, promotion)	◯	◯	◯	◯	◯
Sales (e.g. Key Account Strategy, General Sales Strategy, etc.)	◯	◯	◯	◯	◯
Operational strategy (for procurement, quality management, production, logistics)	◯	◯	◯	◯	◯
Overall business strategy (business planning or business model planning)	◯	◯	◯	◯	◯
Financial planning	◯	◯	◯	◯	◯
Human Resource (HR) Strategy	◯	◯	◯	◯	◯

5. Target setting / tactical planning

Tactical planning describes the derivation of short-term actions and plans from the long-term strategy (evaluated in the previous step). Thus, the tactical planning horizon is shorter than the strategic plan horizon.

Decisions in this area are

	supported through spreadsheets (e.g. Microsoft Excel)	supported through a computer-based tool	not supported, but it would be beneficial if they were.	support through any IT system is not necessary.	I don't know / I don't want to specify
Marketing	◯	◯	◯	◯	◯
Sales	◯	◯	◯	◯	◯
Operations	◯	◯	◯	◯	◯
Budgeting	◯	◯	◯	◯	◯
Human Resource (HR) planning	◯	◯	◯	◯	◯

6. Reporting

This includes and refers to the evaluation of performance, goals and tactics as well as tracking progress and efficiency for systematic improvement.

Decisions in this area are

	supported through spreadsheets (e.g. Microsoft Excel)	supported through a computer-based tool	not supported, but it would be beneficial if they were	support through any IT system is not necessary	I don't know / I don't want to specify
Marketing	◯	◯	◯	◯	◯
Sales	◯	◯	◯	◯	◯
Operations	◯	◯	◯	◯	◯
Financial Reporting	◯	◯	◯	◯	◯
HR reporting	◯	◯	◯	◯	◯

7. Others

Decisions in this area are

	spreadsheet (e.g. Microsoft Excel) supported	IT-tool supported	not supported, but support would be beneficial.	support through IT-tool not necessary	I don't know / I don't want to specify
Gaining business insights across departments	◯	◯	◯	◯	◯
Personal task management (task priorization and scheduling)	◯	◯	◯	◯	◯
Negotiating and supporting negotiations of all kind	◯	◯	◯	◯	◯
Report outcomes to upper management	◯	◯	◯	◯	◯
Communication within the team (in general and communication of goals, strategies and tactics)	◯	◯	◯	◯	◯
Communication outside of the team and external	◯	◯	◯	◯	◯
Collection of information within the organization	◯	◯	◯	◯	◯
Definition of processes within the team and process optimization	◯	◯	◯	◯	◯
Defend decisions in retrospect	◯	◯	◯	◯	◯
Generic decision making through the assistance of decision-trees, statistical simulation, etc.	◯	◯	◯	◯	◯
Selection and planning of projects to be implemented	◯	◯	◯	◯	◯

Department - related decisions

8. Marketing

Decisions in this area are

	spreadsheet (e.g. Microsoft Excel) supported	IT-tool supported	not supported but support would be beneficial	support through IT-tool not necessary	I don't know / I don't want to specify
Developing marketing programmes and measures from the predefined strategy	◯	◯	◯	◯	◯
Market segment definition and target group analysis	◯	◯	◯	◯	◯
Market demand and market size forecasting	◯	◯	◯	◯	◯
Competitor analysis	◯	◯	◯	◯	◯
Product planning, strategy and roadmapping	◯	◯	◯	◯	◯
Marketing research (trend research, pattern analsis)	◯	◯	◯	◯	◯
Marketing execution (campaign planning, target group selection, execution of marketing measures)	◯	◯	◯	◯	◯

9. Sales

Decisions in this area are

	spreadsheet (e.g. Microsoft Excel) supported	IT - tool supported	not supported, but support would be beneficial	support through IT-tool not necessary	I don't know / I don't want to specify
Contract Life-Cycle Management	◯	◯	◯	◯	◯
Quotation management (Pricing, Quotation setting, etc.)	◯	◯	◯	◯	◯
Sales forecasting / Sales pipeline management	◯	◯	◯	◯	◯
Sales employee Performance and Compensation Management	◯	◯	◯	◯	◯

10. Operations

Decisions in this area are

	spreadsheet (e.g. Microsoft Excel) supported	IT - tool supported	not supported but support would be beneficial	support through IT- tool not necessary	I don't know / I don't want to specify
Production planning, execution and production planning optimization (e.g. capacity planning, cycle time reduction, yield management)	◯	◯	◯	◯	◯
Quality management execution and optimization	◯	◯	◯	◯	◯
Procurement execution and optimization	◯	◯	◯	◯	◯
Logistics (e.g. distribution planning and optimization)	◯	◯	◯	◯	◯
Process management and optimization (e.g. streamlining processes, identifying inefficiencies)	◯	◯	◯	◯	◯

11. Finance

Decisions in this area are

	spreadsheet (e.g. Microsoft Excel) supported	IT-tool supported	not supported, but support would be beneficial.	support through IT- tool not necessary	I don't know / I don't want to specify
Financial management (operational)	◯	◯	◯	◯	◯

12. Human Resources

Decision in this are are

	spreadsheet (e.g. Microsoft Excel) supported	IT-tool supported	not supported, but support would be beneficial	support through IT- tool not necessary	I don't know / I don't want to specify
Employee deployment (e.g. task management, task allocation, task delegation)	◯	◯	◯	◯	◯
Employee assessment, development and training	◯	◯	◯	◯	◯
Leadership	◯	◯	◯	◯	◯
Cultural definition and development (e.g. target profile definition, value definition)	◯	◯	◯	◯	◯
Team building	◯	◯	◯	◯	◯
Talent management and candidate selection	◯	◯	◯	◯	◯

Details on tool use

13. Please indicate some details on tools you are using for STRATEGIC DECISIONS, TARGET SETTING and PLANNING. Please name the tool(s) (vendor and / or system name) in use.

14. Please indicate some details on tools you are using to support REPORTING. Please name the tool(s) (vendor and / or system name) in use.

15. Please indicate some details on tools you are using to support MARKETING decisions. Please name the tool(s) (vendor and / or system name) in use.

16. **Please indicate some details on tools you are using to support SALES decisions. Please name the tool(s) (vendor and / or system name) in use.**

17. **Please indicate some details on tools you are using to support OPERATIONS decisions. Please name the tool(s) (vendor and / or system name) in use.**

18. **Please indicate some details on tools you are using for supporting FINANCE decisions. Please name the tool(s) (vendor and / or system name) you are using.**

19. **Please indicate some details on tools you are using for supporting HUMAN RESOURCE or LEADERSHIP decisions. Please name the tool(s) (vendor and / or system name) you are using.**

20. **Please indicate some details on OTHER tools you are using for decision support**

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21. How satisfied are you with the functionalities the IT tool market offers for supporting managerial decisions? On a scale of 1-5, how do you rate the market offering in each functional area you oversee?

	very dissatisfied	mostly dissatisfied	I don't know / I don't wish to indicate	mostly satisfied	very satisfied
Sales	◯	◯	◯	◯	◯
Marketing	◯	◯	◯	◯	◯
Operations	◯	◯	◯	◯	◯
Personal planning / Generic	◯	◯	◯	◯	◯
HR	◯	◯	◯	◯	◯
General leadership and management tools	◯	◯	◯	◯	◯

22. When selecting new decision support tools, which capability is important to you? Arrange the statements below in sequential order.

8 being the one most important; 1 being the one least important

- [ ] Statistical analyses and precise calculation of important KPIs
- [ ] Combination of data from different sources and areas for a uniform and comprehensive picture
- [ ] Advanced technical possibilities, such as artificial intelligence or machine learning
- [ ] The tool can automatically make recommendations for action based on calculated thresholds for specific KPIs
- [ ] Automated data collection from one area
- [ ] Automated workflows, which the system can execute itself on predefined rules
- [ ] Visual analysis capabilities, such as the automatic calculation of dashboards or scorecards
- [ ] Predictive and prescriptive analytics functions: data analysis that goes beyond statistical data analysis and also allows a possible view of future events

Additional Information

23. How long have you held your current position for?

- ◯ less than 6 months
- ◯ 6-12 months
- ◯ 1-2 years
- ◯ more than 2 years

24. Please indicate the level at which your current position is located in the company hierarchy.

- ◯ First Line supervisor, such as team manager or supervisor
- ◯ Mid-Level Manager (supervising other managers and reporting to upper management / executive level)
- ◯ Executive (Top) Level Management (e.g. VP, President, Chairman of the board, etc.)

25. Which regional areas are you responsible for?

- ◯ DACH
- ◯ Western Europe
- ◯ Eastern Europe / CEE
- ◯ Germany only
- ◯ Austria only
- ◯ others (please specify) [ ]

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26. Please select the industry in which you are operating

Agriculture, Forestry, Fishing and Hunting ▼

27. Please select the applicable company size by turnover (in EUR)

- ◯ < 2 million EUR
- ◯ 2 - 10 million EUR
- ◯ 11 - 50 million EUR
- ◯ 50 million - 1 billion EUR
- ◯ > 1 billion EUR

28. Please select the applicable company size by number of employees

- ◯ less than 50 employees
- ◯ more than 50 and fewer than 250 employees
- ◯ more than 250 and fewer than 500 employees
- ◯ more than 500 and fewer than 1000 employees
- ◯ more than 1000 employees

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29. Please indicate your gender

- ◯ male
- ◯ female
- ◯ others / not specified

30. Please indicate your age

- ◯ Younger than 25
- ◯ 25 - 34
- ◯ 35 - 44
- ◯ 45 - 54
- ◯ 55 and older

31. Please indicate the highest level of education you have obtained.

- ◯ Apprenticeship (Lehre / Berufsakademie)
- ◯ A-Levels / High school diploma (Abitur / Matura) and apprenticeship (Lehre)
- ◯ University Degree
- ◯ Doctorate

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You have reached the end of the survey.

Thank you very much for your participation! Your help is very much appreciated.

Stay safe and healthy!

32. If you are interested, you can register to receive the results of this study. For this purpose please enter your e-mail address below.

We will only use this address to contact you once with the results of this study and we will store it separately from your previously given answers to ensure that your answers are treated anonymously.
Your data will not be passed on to third parties and will be deleted once the research is complete.

» Umleitung auf Schlussseite von Umfrage Online

For open questions 13-20, the following hints were given as mouse-over tool tips :

13. STRATEGIC DECISIONS:

Tools might include but are not limited to: Business Intelligence & Analytics Vendors, such as Oracle, Workday Adaptive Insights, and others. This might also include business planning tools, department-focused planning tools, strategy execution tools or various others.

14. REPORTING

Systems might include department-based reporting and analytics software, Business Analytics or Business Intelligence tools or others.

Vendors and their tools might include, but are not limited to e.g. Tableau, Qlik, SAP Data Cloud, TIBCO, SAS, Yellowfin, IBM, Sisense or any other Analytics tools. This also includes insight engines, such as Mindbreeze, IBM, Attivio or others.

15. MARKETING

Tools might include marketing automation software, campaign planning execution, multi-channel marketing management, or any other marketing execution, market research, competitor analysis, or brand management tools and others.

Vendors and their tools might include, but are not limited to e.g. SAP Marketing Cloud, Salesforce Marketing Cloud, SAS Customer Intelligence 360, Zeta Marketing Platform, Marketo, Oracle Marketing Cloud, Adobe Experience Cloud, Acoustic Marketing Platform, Teradata Analytics Platform, IBM Watson Customer Insights.

16. SALES

Tools might include sales force automation or CRM software, Contract or Quotation systems or others.

Vendors and their tools might include, but are not limited to bpm online, Salesforce, SAP Sales Cloud, SugarCRM, Copper, CRM Next, Microsoft Dynamics, Oracle Engagement Cloud or others.

17. OPERATIONS

Vendors and their tools might include, but are not limited to: ERP components or solutions from vendors such as SAP, Oracle, Microsoft, IBM or any others, solutions based on parts of the operations tasks, such as procurement, quality management or logistics tools. Another example are Supply Chain tools or Process Management vendors such as celonis or others.

18. FINANCE

Tools might include finance-relevant capabilities of ERP systems, Financial Management, Financial Close or Performance Management tools or others.

Vendors and their tools might include, but are not limited to Oracle, Workday, Sage Intact, SAP, Microsoft, Acumatica, Financial Force, Unit4 or others.

19. HR / LEADERSHIP

Details might entail HR software, Talent and Candidate management, Training software, HR-relevant ERP components or others.

Vendors and their tools might include, but are not limited to: ADP Workforce Now, Ceridian, Cornerstone OnDemand, Infor, Kronos, Meta4, Oracle HCM Cloud, Ramco, Systems, SAP Success Factors, Talentsoft, Ultimate Software, Workday, or others.

20. OTHERS

Tools might include but are not limited to task management tools, negotiation support tools, communication tools, process management tools, project and idea management tools or others.

SURVEY GERMAN

For open questions 13-20, the following hints were given in mouse-over tooltips :

13. STRATEGIC DECISIONS:

Zu den Instrumenten könnten u.a. gehören: Anbieter von Business Intelligence & Analytics Systemen, wie Oracle, Workday Adaptive Insights und andere. Dazu können auch Tools für die Geschäftsplanung, abteilungsfokussierte Planungstools, Tools für die Ausführung von Strategien oder verschiedene andere gehören.

14. REPORTING

Die Systeme könnten abteilungsbasierte Berichts- und Analysesoftware, Business Analytics- oder Business Intelligence-Tools oder andere umfassen.

Zu den Anbietern und ihren Tools könnten z.B. Tableau, Qlik, SAP Data Cloud, TIBCO, SAS, Yellowfin, IBM, Sisense oder andere Analytics-Tools oder andere, gehören. Dazu gehören auch Insight-Engines, wie z.B. Mindbreeze, IBM, Attivio oder andere.

15. MARKETING

Zu den Tools könnten Software zur Marketingautomatisierung, Kampagnenplanung und -durchführung, Multi-Channel-Marketing-Management, Marktforschung, Wettbewerberanalyse oder Markenmanagementtools und andere gehören.

Zu den Anbietern und ihren Tools können unter anderem gehören: SAP Marketing Cloud, Salesforce Marketing Cloud, SAS Customer Intelligence 360, Zeta Marketing Platform, Marketo, Oracle Marketing Cloud, Adobe Experience Cloud, Acoustic Marketing Platform, Teradata Analytics Platform, IBM Watson Customer Insights.

16. SALES

Zu den Tools können die Automatisierung des Außendienstes oder CRM-Software, Vertrags- oder Angebotssysteme oder andere gehören.

Zu den Anbietern und ihren Tools können unter anderem bpm online, Salesforce, SAP Sales Cloud, SugarCRM, Copper, CRM Next, Microsoft Dynamics, Oracle Engagement Cloud oder andere gehören.

17. OPERATIONS

Zu den Anbietern und ihren Werkzeugen können unter anderem folgende gehören: ERP-Komponenten oder -Lösungen von Anbietern wie SAP, Oracle, Microsoft, IBM oder anderen; Lösungen, die auf Teilen der operativen Aufgaben basieren, wie z.B. Beschaffungs-, Qualitätsmanagement- oder Logistiktools. Ein weiteres Beispiel sind Supply-Chain-Tools oder Prozessmanagement-Anbieter wie celonis oder andere.

18. FINANCE

Zu den Tools können finanzrelevante Funktionen von ERP-Systemen, Finanzmanagement, Finanzabschluss- oder Performance-Management-Tools oder andere gehören.

Zu den Anbietern und ihren Tools können unter anderem Oracle, Workday, Sage Intact, SAP, Microsoft, Acumatica, Financial Force, Unit4 oder andere gehören.

19. HR / LEADERSHIP

Details können HR-Software, Talent- und Kandidatenmanagement, Schulungssoftware, HR-relevante ERP-Komponenten oder andere umfassen.

Anbieter und ihre Tools können u.a. einschließen, sind aber nicht darauf beschränkt: ADP Workforce Now, Ceridian, Cornerstone OnDemand, Infor, Kronos, Meta4, Oracle HCM Cloud, Ramco, Systems, SAP Success Factors, Talentsoft, Ultimate Software, Workday oder andere.

20. OTHERS

Dazu könnten u.a. gehören: Tools für das Aufgabenmanagement, Tools zur Unterstützung von Verhandlungen, Kommunikationstools, Tools für das Prozessmanagement, Tools für das Projekt- und Ideenmanagement oder andere.

SURVEY RESULTS – DEMAND QUANTITIES PER MANAGERIAL LEVEL

AMOUNTS:
Low-level: 19
Mid-level: 50
High-level: 33
TOTAL: 102

	total		*low-level*		*mid-level*		*high-level*		supported through spreadsheets (e.g. Microsoft Excel) (1)				supported through a computerbased tool I am actively using (2)				not supported, but it would improve my managerial duty if they were. (3)				decision support through any IT system is not necessary. (4)				I don't know / I don't want to specify (0)			
	Ø	±	Ø	±	Ø	±	Ø	±	**total**	low	mid	high	**total**	low	mid	high	**total**	low	mid	high	**total**	low	mid	high	**total**	low	mid	high
STRATEGY																												
Marketing (product, price, place, promotion)	1,70	0,80	1,28	1,02	1,56	0,92	1,70	0,81	**40,8%**	11,1%	50,0%	45,5%	**36,9%**	50,0%	29,2%	45,5%	**6,8%**	5,6%	10,4%	3,0%	**3,9%**	0,0%	4,2%	6,1%	**11,7%**	33,3%	6,3%	0,0%
Sales (e.g. Key Account Strategy, General Sales Strategy, etc.)	1,84	0,70	1,68	0,89	1,81	0,79	1,85	0,57	**28,2%**	36,8%	31,3%	21,2%	**59,2%**	47,4%	54,2%	75,8%	**4,9%**	5,3%	8,3%	0,0%	**3,9%**	5,3%	4,2%	3,0%	**3,9%**	5,3%	2,1%	0,0%
Operational strategy (for procurement, quality management, production, logistics)	1,85	0,67	1,68	1,00	1,63	0,86	1,76	0,71	**24,3%**	15,8%	26,5%	27,3%	**59,2%**	57,9%	57,1%	63,6%	**2,9%**	5,3%	2,0%	3,0%	**3,9%**	5,3%	4,1%	3,0%	**9,7%**	15,8%	10,2%	3,0%
Overall Business Strategy (Business planning or business model planning)	1,69	0,82	1,47	0,96	1,43	1,06	1,61	0,75	**42,7%**	36,8%	42,6%	51,5%	**32,0%**	31,6%	27,7%	39,4%	**7,8%**	15,8%	6,4%	6,1%	**3,9%**	0,0%	6,4%	3,0%	**13,6%**	15,8%	17,0%	0,0%
Financial planning	1,69	0,58	1,37	0,90	1,40	0,85	1,61	0,61	**30,1%**	26,3%	36,2%	27,3%	**51,5%**	47,4%	44,7%	66,7%	**1,9%**	5,3%	2,1%	0,0%	**1,0%**	0,0%	2,1%	0,0%	**15,5%**	21,1%	14,9%	6,1%
Human Resource (HR) Strategy	2,08	0,95	1,84	1,12	1,75	1,19	1,94	1,03	**25,2%**	15,8%	25,0%	33,3%	**37,9%**	42,1%	35,4%	42,4%	**12,6%**	21,1%	12,5%	9,1%	**9,7%**	5,3%	10,4%	12,1%	**14,6%**	15,8%	16,7%	3,0%
TACTICAL PLANNING																												
Marketing	1,90	1,01	1,21	1,32	1,81	1,18	1,61	0,93	**37,6%**	***15,8%***	41,7%	45,5%	**28,7%**	31,6%	22,9%	36,4%	**8,9%**	0,0%	14,6%	6,1%	**9,9%**	10,5%	12,5%	6,1%	**14,9%**	42,1%	8,3%	6,1%
Sales	1,79	0,71	1,79	0,98	1,62	0,64	1,91	0,72	**34,0%**	36,8%	40,4%	24,2%	**54,0%**	36,8%	51,1%	66,7%	**7,0%**	15,8%	6,4%	3,0%	**3,0%**	5,3%	0,0%	6,1%	**2,0%**	5,3%	2,1%	0,0%
Operations	1,72	0,58	1,37	0,90	1,41	0,70	1,76	0,79	**29,7%**	26,3%	34,7%	24,2%	**54,5%**	47,4%	53,1%	60,6%	**3,0%**	5,3%	0,0%	6,1%	**1,0%**	0,0%	0,0%	3,0%	**11,9%**	21,1%	12,2%	6,1%
Budgeting	1,52	0,56	1,21	0,79	1,40	0,61	1,58	0,61	**48,5%**	36,8%	54,2%	48,5%	**42,6%**	42,1%	39,6%	45,5%	**3,0%**	0,0%	2,1%	6,1%	**0,0%**	0,0%	0,0%	0,0%	**5,9%**	21,1%	4,2%	0,0%
Human Resources planning	1,91	0,97	1,47	0,90	1,67	1,12	2,00	1,09	**37,0%**	31,6%	35,4%	42,4%	**35,0%**	42,1%	35,4%	30,3%	**9,0%**	10,5%	6,3%	12,1%	**10,0%**	0,0%	10,4%	15,2%	**9,0%**	15,8%	12,5%	0,0%
REPORTING																												
Marketing	1,97	0,88	1,21	1,18	1,96	1,09	1,70	0,77	**27,7%**	21,1%	25,0%	3,0%	**41,6%**	31,6%	39,6%	51,5%	**10,9%**	5,3%	16,7%	6,1%	**6,9%**	5,3%	10,4%	3,0%	**12,9%**	36,8%	8,3%	3,0%
Sales	1,71	0,59	1,53	0,90	1,71	0,58	1,73	0,52	**34,7%**	52,6%	29,2%	0,0%	**58,4%**	31,6%	64,6%	66,7%	**4,0%**	5,3%	4,2%	3,0%	**1,0%**	5,3%	0,0%	0,0%	**2,0%**	5,3%	2,1%	0,0%
Operations	1,70	0,59	1,11	0,74	1,55	0,68	1,76	0,79	**32,4%**	47,4%	30,6%	6,1%	**53,9%**	31,6%	59,2%	60,6%	**2,9%**	0,0%	2,0%	6,1%	**1,0%**	0,0%	0,0%	3,0%	**9,8%**	21,1%	8,2%	6,1%
Financial Reporting	1,67	0,52	1,26	0,81	1,47	0,72	1,70	0,59	**31,0%**	31,6%	34,0%	3,0%	**56,0%**	47,4%	53,2%	66,7%	**2,0%**	0,0%	2,1%	3,0%	**0,0%**	0,0%	0,0%	0,0%	**11,0%**	21,1%	10,6%	3,0%
HR Reporting	1,89	0,79	1,47	0,90	1,71	0,97	1,81	0,93	**27,0%**	31,6%	20,8%	3,1%	**51,0%**	42,1%	56,3%	50,0%	**5,0%**	10,5%	4,2%	3,1%	**6,0%**	0,0%	6,3%	9,4%	**11,0%**	15,8%	12,5%	3,1%
OTHERS																												
Gaining business insights across departments	1,90	0,83	1,79	1,03	1,88	0,96	1,70	0,77	**33,0%**	26,3%	28,0%	45,5%	**43,7%**	42,1%	44,0%	42,4%	**13,6%**	15,8%	16,0%	9,1%	**4,9%**	5,3%	6,0%	3,0%	**4,9%**	10,5%	6,0%	0,0%
Personal task management (task priorization and scheduling)	2,07	0,88	2,00	0,88	1,98	0,87	2,24	0,90	**25,2%**	31,6%	30,0%	15,2%	**52,4%**	42,1%	50,0%	60,6%	**12,6%**	21,1%	12,0%	9,1%	**9,7%**	5,3%	8,0%	15,2%	**0,0%**	0,0%	0,0%	0,0%
Negotiating and supporting negotiations of all kind	2,30	1,09	2,06	1,43	2,19	1,07	2,33	1,08	**29,0%**	33,3%	29,2%	27,3%	**28,0%**	22,2%	29,2%	30,3%	**22,0%**	5,6%	27,1%	24,2%	**18,0%**	27,8%	12,5%	18,2%	**3,0%**	11,1%	2,1%	0,0%
Report outcomes to upper management	1,58	0,63	1,37	0,50	1,64	0,66	1,64	0,65	**49,5%**	63,2%	46,0%	45,5%	**42,7%**	36,8%	44,0%	45,5%	**7,8%**	0,0%	10,0%	9,1%	**0,0%**	0,0%	0,0%	0,0%	**0,0%**	0,0%	0,0%	0,0%
Communication within the team (in general and communication of goals, strategies and tactics)	1,96	0,88	1,74	0,73	2,00	0,97	2,00	0,87	**30,1%**	36,8%	28,0%	27,3%	**52,4%**	57,9%	50,0%	54,5%	**6,8%**	0,0%	8,0%	9,1%	**9,7%**	5,3%	12,0%	9,1%	**1,0%**	0,0%	2,0%	0,0%
Communication outside of the team and external	2,25	1,05	1,58	0,90	2,42	1,23	1,97	1,02	**24,5%**	47,4%	16,0%	24,2%	**39,2%**	36,8%	36,0%	45,5%	**12,7%**	5,3%	14,0%	15,2%	**17,6%**	5,3%	28,0%	9,1%	**5,9%**	5,3%	6,0%	6,1%
Collection of information within the organization	1,90	0,68	1,79	0,79	1,92	0,75	1,91	0,58	**27,2%**	26,3%	32,0%	18,2%	**55,3%**	52,6%	44,0%	75,8%	**15,5%**	15,8%	24,0%	3,0%	**1,0%**	0,0%	0,0%	3,0%	**1,0%**	5,3%	0,0%	0,0%
Definition of processes within the team and process optimization	2,15	0,87	2,06	1,00	2,12	0,99	2,15	0,76	**24,8%**	33,3%	24,5%	18,2%	**39,6%**	38,9%	32,7%	51,5%	**27,7%**	16,7%	32,7%	27,3%	**5,9%**	11,1%	6,1%	3,0%	**2,0%**	0,0%	4,1%	0,0%
Defend decisions in retrospect	1,99	1,11	1,74	1,05	1,84	1,25	1,85	1,25	**41,7%**	42,1%	46,0%	33,3%	**23,3%**	36,8%	16,0%	27,3%	**11,7%**	5,3%	14,0%	12,1%	**14,6%**	10,5%	16,0%	15,2%	**8,7%**	5,3%	8,0%	12,1%
Generic decision making through the assistance of decision-trees, statistical simulation, etc.	2,48	0,97	1,68	1,29	2,16	1,33	2,18	1,18	**17,5%**	15,8%	14,0%	21,2%	**19,4%**	26,3%	14,0%	24,2%	**35,9%**	26,3%	42,0%	33,3%	**10,7%**	5,3%	12,0%	12,1%	**16,5%**	26,3%	18,0%	9,1%
Selection and planning of projects to be implemented	2,05	0,99	1,79	0,98	1,98	1,12	2,06	1,03	**34,0%**	36,8%	32,0%	36,4%	**34,0%**	36,8%	32,0%	33,3%	**17,5%**	15,8%	18,0%	18,2%	**10,7%**	5,3%	12,0%	12,1%	**3,9%**	5,3%	6,0%	0,0%
MARKETING																												
Developing marketing programmes and measures from the predefined strategy	1,64	0,78	1,50	0,71	1,57	1,02	1,40	0,83	**45,2%**	50,0%	50,0%	40,0%	**35,5%**	50,0%	28,6%	40,0%	**6,5%**	0,0%	7,1%	6,7%	**3,2%**	0,0%	7,1%	0,0%	**9,7%**	0,0%	7,1%	13,3%
Market segment definition and target group analysis	2,00	1,04	1,50	0,71	2,00	1,36	1,80	0,94	**35,5%**	50,0%	42,9%	26,7%	**35,5%**	50,0%	14,3%	53,3%	**9,7%**	0,0%	14,3%	6,7%	**12,9%**	0,0%	21,4%	6,7%	**6,5%**	0,0%	7,1%	6,7%
Market demand and market size forecasting	1,66	0,81	1,50	0,71	1,43	0,85	1,67	0,98	**48,4%**	50,0%	57,1%	40,0%	**32,3%**	50,0%	21,4%	40,0%	**9,7%**	0,0%	14,3%	6,7%	**3,2%**	0,0%	0,0%	6,7%	**6,5%**	0,0%	7,1%	6,7%
Competitor analysis	1,66	0,81	1,50	0,71	1,43	1,02	1,67	0,82	**51,6%**	50,0%	50,0%	53,3%	**22,6%**	50,0%	14,3%	26,7%	**19,4%**	0,0%	21,4%	20,0%	**0,0%**	0,0%	0,0%	0,0%	**6,5%**	0,0%	14,3%	0,0%
Product planning, strategy and roadmapping	1,76	0,79	1,50	0,71	1,93	1,07	1,40	0,63	**38,7%**	50,0%	28,6%	46,7%	**41,9%**	50,0%	35,7%	46,7%	**9,7%**	0,0%	21,4%	0,0%	**3,2%**	0,0%	7,1%	0,0%	**6,5%**	0,0%	7,1%	6,7%
Marketing research (trend research, pattern analsis)	7,93	1,03	1,00	0,00	2,00	1,30	1,73	0,96	**45,2%**	100,0%	42,9%	40,0%	**16,1%**	0,0%	7,1%	26,7%	**25,8%**	0,0%	28,6%	26,7%	**6,5%**	0,0%	14,3%	0,0%	**6,5%**	0,0%	7,1%	6,7%
Marketing execution (campaign planning, target group selection, execution of measures)	1,86	0,69	1,50	0,71	1,86	0,86	1,67	0,82	**29,0%**	50,0%	21,4%	33,3%	**48,4%**	50,0%	50,0%	46,7%	**16,1%**	0,0%	21,4%	13,3%	**0,0%**	0,0%	0,0%	0,0%	**6,5%**	0,0%	7,1%	6,7%
SALES																												
Contract Life-Cycle Management	1,91	0,67	1,36	0,67	1,80	0,96	1,50	0,92	**20,3%**	45,5%	17,1%	11,1%	**56,3%**	45,5%	57,1%	61,1%	**6,3%**	0,0%	8,6%	5,6%	**3,1%**	0,0%	5,7%	0,0%	**14,1%**	9,1%	11,4%	22,2%
Quotation management (Pricing, Quotation setting, etc.)	1,85	0,62	1,73	0,79	1,86	0,69	1,72	0,67	**25,0%**	18,2%	28,6%	22,2%	**62,5%**	63,6%	60,0%	66,7%	**7,8%**	9,1%	8,6%	5,6%	**1,6%**	0,0%	2,9%	0,0%	**3,1%**	9,1%	0,0%	5,6%
Sales forecasting / Sales pipeline management	1,72	0,49	1,64	0,50	1,74	0,51	1,72	0,46	**29,7%**	36,4%	28,6%	27,8%	**68,8%**	63,6%	68,6%	72,2%	**1,6%**	0,0%	2,9%	0,0%	**0,0%**	0,0%	0,0%	0,0%	**0,0%**	0,0%	0,0%	0,0%
Sales employee Performance and Compensation Management	1,87	0,69	1,55	0,69	1,89	0,90	1,72	0,57	**25,0%**	27,3%	28,6%	16,7%	**62,5%**	63,6%	54,3%	77,8%	**3,1%**	0,0%	5,7%	0,0%	**4,7%**	0,0%	8,6%	0,0%	**4,7%**	9,1%	2,9%	5,6%
OPERATIONS																												
Production planning, execution and production planning optimization (e.g. capacity planning, cycle time reduction, yield management)	1,77	0,61	**0,75**	0,50	2,00	0,47	1,60	0,84	**29,2%**	75,0%	10,0%	30,0%	**54,2%**	0,0%	80,0%	50,0%	**8,3%**	0,0%	10,0%	10,0%	**0,0%**	0,0%	0,0%	0,0%	**8,3%**	25,0%	0,0%	10,0%
Quality management execution and optimization	2,18	0,85	**1,00**	0,82	2,20	0,79	2,20	1,14	**20,8%**	50,0%	20,0%	10,0%	**37,5%**	25,0%	40,0%	40,0%	**29,2%**	0,0%	40,0%	30,0%	**4,2%**	0,0%	0,0%	10,0%	**8,3%**	25,0%	0,0%	10,0%
Procurement execution and optimization	1,91	0,73	1,50	0,58	1,70	0,48	**2,10**	1,10	**25,0%**	50,0%	30,0%	10,0%	**58,3%**	50,0%	70,0%	50,0%	**8,3%**	0,0%	0,0%	20,0%	**4,2%**	0,0%	0,0%	10,0%	**4,2%**	0,0%	0,0%	10,0%
Logistics (e.g. distribution planning and optimization)	2,18	0,80	2,50	1,29	2,10	0,74	**1,70**	1,06	**16,7%**	25,0%	20,0%	10,0%	**45,8%**	25,0%	50,0%	50,0%	**25,0%**	25,0%	30,0%	20,0%	**4,2%**	25,0%	0,0%	0,0%	**8,3%**	0,0%	0,0%	20,0%
Process management and optimization (e.g. streamlining processes, identifying inefficiencies)	2,39	0,89	2,50	0,58	2,30	1,34	2,20	0,79	**16,7%**	0,0%	20,0%	20,0%	**33,3%**	50,0%	20,0%	40,0%	**37,5%**	50,0%	30,0%	40,0%	**8,3%**	0,0%	20,0%	0,0%	**4,2%**	0,0%	10,0%	0,0%
FINANCE																												
Financial management (operational)	1,85	0,38	2,00		2,00	0,00	1,75	0,46	**15,4%**	0%	0,0%	25,0%	**84,6%**	100,0%	100,0%	75,0%									**0**			
HR																												
Employee deployment (e.g. task management, task allocation, task delegation)	2,22	1,02	**1,42**	0,77	2,28	1,14	2,18	1,13	**24,5%**	42,1%	18,0%	24,2%	**40,2%**	42,1%	36,0%	45,5%	**13,7%**	5,3%	22,0%	6,1%	**15,7%**	0,0%	18,0%	21,2%	**5,9%**	10,5%	6,0%	3,0%
Employee assessment, development and training	1,89	0,68	1,63	0,68	1,82	0,77	1,97	0,73	**25,5%**	31,6%	26,0%	21,2%	**59,8%**	57,9%	56,0%	66,7%	**8,8%**	5,3%	12,0%	6,1%	**2,9%**	0,0%	2,0%	6,1%	**2,9%**	5,3%	4,0%	0,0%
Leadership	2,49	1,08	**1,79**	1,13	2,58	1,21	2,39	1,09	**18,6%**	47,4%	10,0%	15,2%	**35,3%**	21,1%	36,0%	42,4%	**16,7%**	15,8%	16,0%	18,2%	**24,5%**	10,5%	32,0%	21,2%	**4,9%**	5,3%	6,0%	3,0%
Cultural definition and development (e.g. target profile definition, value definition)	2,67	1,06	2,16	1,34	2,62	1,26	2,39	1,17	**14,7%**	26,3%	12,0%	12,1%	**27,5%**	21,1%	20,0%	42,4%	**23,5%**	21,1%	30,0%	15,2%	**26,5%**	21,1%	30,0%	24,2%	**7,8%**	10,5%	8,0%	6,1%
Teambuilding	3,04	1,10	**2,26**	1,63	3,02	1,30	2,70	1,24	**11,8%**	15,8%	12,0%	9,1%	**17,6%**	15,8%	10,0%	30,3%	**16,7%**	10,5%	18,0%	18,2%	**45,1%**	36,8%	54,0%	36,4%	**8,8%**	21,1%	6,0%	6,1%
Talent management and candidate selection	2,30	0,87	**1,79**	1,13	2,10	1,05	2,27	1,01	**11,8%**	5,3%	12,0%	15,2%	**52,9%**	52,6%	56,0%	48,5%	**13,7%**	15,8%	10,0%	18,2%	**12,7%**	5,3%	14,0%	15,2%	**8,8%**	21,1%	8,0%	3,0%

ZUSAMMENFASSUNG

Mit wissenschaftlich gefestigten Konzepten, die bis zum Ende des letzten Jahrhunderts entwickelt wurden, ist DSS nach wie vor ein hoch relevantes Gebiet, nicht nur in der Forschung, sondern auch in der Praxis. Themen wie digitale Transformation oder Business Intelligence gehören zum Standardvokabular eines jeden Managers. Ziel dieser Arbeit ist es, Engpässe im Bezug auf Angebot und Nachfrage von DSS-Werkzeugen für General Middle Manager in Österreich, Deutschland und den CEE-Staaten zu identifizieren. Vor Allem werden jedoch Diskrepanzen zwischen Angebot und Nachfrage aufgezeigt.

Zu diesem Zweck wurde ein Entscheidungsmodell zur Strukturierung aller von GMM getroffenen Entscheidungen sowie ein Klassifikationsschema zum Vergleich und zur Bewertung von DSS-Anwendungen erstellt. Es hat sich gezeigt, dass alle DSS-Werkzeuge Daten, Analyse- und Automatisierungsfähigkeiten vereinen, von denen jede einem Sophistizierungsgrad von niedrig bis hoch zugewiesen werden kann. Durch die Analyse von 222 Anbietern und deren Angebot wurde ein gründlicher repräsentativer Querschnitt des Marktes hinsichtlich aller drei Komponenten erstellt. Die Analyse der Nachfrageseite erfolgte mittels einer Online-Umfrage mit 103 Teilnehmern.

Die Ergebnisse zeigen eine starke Verlagerung hin zu integrativen, ganzheitlichen Applikationen, die ein breites Spektrum von Prozessen und Entscheidungen abdecken. Insbesondere bei generischen Managemententscheidungen überwiegt die Nachfrage das Angebot erheblich. In den meisten Funktionsbereichen halten sich Angebot und Nachfrage die Waage, allerdings gibt es geringfügige Unterschiede zwischen den verschiedenen Abteilungen. Die Ergebnisse helfen einerseits den Anbietern, GMM-Anforderungen zu verstehen, um mögliche Lücken zu identifizieren. Andererseits helfen sie Managern, technische Konzepte, Marktverfügbarkeit und Marktdurchschnitt zu verstehen, indem sie Konzepte, Fähigkeiten und Abgrenzungen beleuchten. Die daraus gewonnenen Erkenntnisse unterstreichen die Bedeutung eines integrativen Datenmanagements und einer umfassenden Informationssammlung, um realistische Zusammenhänge erkennen und ganzheitliche Erkenntnisse gewinnen zu können.