POLITECNICO DI TORINO

Master's Degree in Management Engineering

Master's Degree Thesis

CSF of BI implementation in the metallurgical/ manufacturing sector for middle sized companies

Supervisors

Prof. De Marco Alberto

Rebuglio Massimo

Candidate

Keraj Genta

TABLE OF CONTENT

1 STATE OF THE ART

Business intelligence has become an important tool for various sectors nowadays, including these of manufacturing and metallurgical. As defined by Craig Stedman, ¨Business intelligence (BI) is a technology-driven process for analyzing data and delivering actionable information that helps executives, managers and workers make informed business decisions. As part of the BI process, organizations collect data from internal IT systems and external sources, prepare it for analysis, run queries against the data and create data visualizations, BI dashboards and reports to make the analytics results available to business users for operational decision-making and strategic planning¨. Thus, the integration of BI systems enables companies not only to analyze large volumes of data, but also to gain further insights into the processes involved, as well as improve the efficiency of resource utilization.

Even though the BI implementation remains crucial for companies, especially in a market that has fluctuations where the companies need to contantly adapt to the recent changes, the success of BI implementation depends on several critical factors. Some of the key success factors already analyzed in other research studies include top management support, technological infrastracture, alignment with business objectives, user engagement, and qualitative and accurate data.

While significant progress has been made in understanding the CSF for the BI implementation in large companies for various sectors, there is no precise research made for the middle - sized companies in metallurgical and manufacturing sector. Considering that these companies face unique challenges, such as limited resources or scalability issues, there is a need for a more thorough study in order to examine the specific constraints and requirements of BI implementation in this group of enterprises.

The study of this paper aims to investigate the CSFs of BI implementation of a middle-sized company in the manufactuing/ metallurgical sector. By

conducting a case study, this research will provide useful insight into the challenges that this group of enterprises faces, with the hope that these findings will contribute to the development of new strategies for the successful adoption of BI, consequently enhancing the performance and competitive advantage.

2 INTRODUCTION

In order to have a better comprehension of the organizational issues associated with resource allocation, internal planning of each department, project delays etc, multiple interviews were conducted with each department of Saet (including different stakeholders: both the head of departments and other workers). The purpose of these interviews is to collect data that can later be used to better analyse the limitations of the current tools implemented in the company, along with what would be the difficulty of implementing a new tool.

2.1 LIMITATIONS OF THE CURRENT BI TOOLS

The main tool used in the company for managing the projects is Microsoft Project. Microsoft Project is a powerful tool for project management, but it does have its own limitations, especially for mid-sized companies. Here are some of the key limitations:

Complexity and Learning Curve: The software can be complex and its functionalities are difficult to learn, requiring significant training for the team.

User Interface: The interface may not be intuitive for all users, this can make it challenging for those not familiar with project management softwares.

Cost (High Licensing Costs): Microsoft Project can be expensive, especially for mid-sized and small companies that need multiple licenses. There are also additional costs related to the training, support, and integration with other tools implemented in the company.

Resource Management: Even though Microsoft Project offers various features of resource management, they are not as advanced or intuitive as other specialized resource management tools. Moreover, for a middle

sized company the resource pool option of the app can be difficult to manage.

Integration and Customization (Limited): While integration with Microsoft products is not so complicated, integrating with non-Microsoft tools could be challenging, while customizing reports, and workflows can be limited compared to other project management tools

Scalability: As the complexity and dimensions of projects increase, performance may slow down, making it less efficient for larger projects, particularly when it comes to resource management.

Support and Updates: Microsoft's support can sometimes be slow, and finding solutions to specific issues might require extensive searches in third-party resources, which can be time-consuming and not efficient.

For mid-sized companies, these limitations might prompt them to consider other project management tools that offer better use, cost-effectiveness, and integration capabilities tailored to their specific needs. Due to other research papers, other management tools like Trello, Asana, or Jira might be more appropriate, depending on the company's requirements.

2.2 DIFFICULTY IN IMPLEMENTING NEW TOOLS

Understanding that the current implemented tools have space for improvement, this research will treat the topic of the challenges encountered in the implementation of new management tools in middle sized companies. Implementing new Business Intelligence (BI) management tools in mid-sized companies can present several challenges. These difficulties often stem from a combination of technical, organizational, and cultural factors. Here are some of the primary difficulties:

Cost and Budget Constraints (Initial Investment): Business Intelligence tools can require a significant initial upfront investment for software licenses, and/or implementation services.

Ongoing Costs: Some additional costs go on maintenance, support, and subscription fees add to the long-term financial commitment.

Complexity and Technical Challenges (Data Integration): Integrating BI tools with existing systems and data sources could be complex and time-consuming. Legacy systems, in particular, can be prone to significant challenges.

Complexity and Technical Challenges (Data Quality): Ensuring data accuracy, consistency stands very important for BI effectiveness but often can be difficult to achieve.

Resource Allocation (Skilled Personnel): Implementing and managing BI tools require either a skilled or an experienced personnel, such as data analysts, data engineers, and IT support.

Time and Effort: The implementation process can be time-consuming, requiring significant effort from various departments, which can disrupt or not allocate this time on other regular business operations.

Change Management (Resistance to Change): Employees may resist adopting new tools and workflows, particularly if they are accustomed for too long to existing processes.

Training and Adoption: Comprehensive training programs are necessary to ensure users are comfortable enough to start working with the new tools, which can be resource-intensive and time consuming as well.

Strategic Alignment (Objectives): Defining strategic objectives for the BI implementation stands crucial. The lack of a clear vision and reasoning in this implementation, it is difficult to measure success and gain in the organization.

Alignment with Business Processes + customization: The new BI tools must align and be compatible with existing business processes and workflows, which may require costly customization and/or adaptation. BI tools may require customization to meet specific business needs, which can be technically challenging and require specialized expertise.

As explained above, addressing these challenges requires a well-thought-out strategy, involving careful planning, stakeholder engagement, and a phased implementation approach to mitigate risks and ensure a successful transition to new BI management tools.

The main purpose of this paper is to answer the research question of which are the main barriers for the implementation of new BI tools in a middle-sized company in the manufacturing and metallurgical sector.

3 MIDDLE- SIZED COMPANIES

This study focuses on a medium-sized company located near Turin. This company exemplifies the typical characteristics of a medium-sized enterprise, making it an ideal case for examining the critical success factors (CSFs) for business intelligence (BI) implementation in similar organizations. By analyzing this company, we can derive insights and deduce the CSFs relevant to BI implementation in medium-sized companies.

As Cam Merritt defines: ''Middle-sized company, occupies the space between small businesses and large corporations. These companies generally have between 50 to 250 employees, although some definitions extend up to 500. Their annual revenue typically ranges from $10 million to $1 billion, depending on the industry and region''. In terms of market position, middle-sized companies hold significant shares, but do not dominate the broader market. They are recognized for their specialized products or services and possess more structured organizational hierarchies than small businesses, with distinct departments for various functions like finance, marketing, HR, and operations. Despite their larger size, they often maintain a degree of flexibility and agility, allowing them to respond quickly to any market fluctuations and innovate accordingly.

These companies are usually in a growth phase, focusing mainly on expanding their market reach, increasing the capacity of their productions, and improving operational efficiency. They do surely have more resources at their disposal than small businesses, as a consequence including better financing options, a more skilled labor force, and advanced technology, although they may still face resource constraints compared to large corporations. Management in middle-sized companies strikes a balance between the hands-on approach of small businesses and the strategic oversight seen in larger organizations, with leadership generally more accessible.

Middle-sized companies, like large companies can significantly influence their local or regional markets. They do also have the proper capacity to enter new markets or introduce new products with a lower risk. It is typical of middle-sized companies to invest in research and development with the purpose of innovating and staying competitive, as well as exploring new technologies and improving existing offerings. Regulatory compliance for such companies is more demanding than for small businesses, requiring attachment to industry standards and administrative regulations.

Medium-sized companies cater to a diverse range of customers, including individuals, other businesses, and occasionally international markets. They hold a vital position in the economy by acting as intermediaries between small businesses and large corporations. These companies are key drivers of innovation, employment, and economic development.

Concerning the organization manner, in a middle-sized company, the organizational structure is typically layered to ensure effective management and operations. The company utilized in this research is a representative middle-sized enterprise, characterized by a similar hierarchical structure. At the top are the executives, such as the CEO, COO, CFO, and CTO, who oversee the company's strategic direction and overall management. Below them, middle management includes department heads like operations, human resources, sales and marketing, and finance managers. Project managers are key in this tier, overseeing specific projects and coordinating teams to meet deadlines and objectives.

In terms of organizational structure, a medium-sized company typically employs a layered approach to ensure effective management and operations. The company examined in this research exemplifies this, featuring a hierarchical organization. At the top, executives such as the CEO, COO, CFO, and CTO are responsible for strategic direction and overall management. Below them, middle management consists of department

heads, including those for operations, human resources, sales and marketing, and finance, as well as project managers who oversee specific initiatives and coordinate teams to meet objectives and deadlines. The company where the research was conducted encompasses all these roles and characteristics, ensuring it aligns well with the study's objectives. By having a comprehensive organizational structure with distinct executive, middle management, technical, and entry-level positions, the company exemplifies a typical medium-sized enterprise. This alignment makes it an ideal subject for investigating the critical success factors for business intelligence implementation in medium-sized companies, thereby providing relevant and applicable insights.

The technical and professional staff, forming the core of the company, include roles such as mechanical designers, coil designers, electrical engineers, electronic engineers, and software developers. These professionals are tasked with creating designs, developing and testing systems, and ensuring that products comply with technical and safety standards. Entry-level positions and interns, such as junior engineers and designers, support senior staff and gain practical experience. This kind of hierarchical structure ensures a balance between strategic oversight and operational efficiency, promoting collaboration and innovation within the company.

4 ACTION RESEARCH METHODOLOGY

To address the research question, this study employed an action research methodology. This approach allowed for iterative cycles of planning, action, observation, and reflection, enabling a thorough examination and practical application of the findings. Interview is one of the common methodology for data gathering and has been mostly used in the built environment. It is currently modelled into various types and very useful for quantitative questions studies as well. A qualitative research interview is a form discussion where the interviewer obtains information from participants relating to personal views about a specific area, usually regarded as a conversation with a purpose or the art of questioning and listening. However, there are various types: structured, semi-structured and unstructured. The semi-structured interview, which is the focus of this paper, provides a different approach compared to the structured and unstructured methods. Under this approach, the questions are somewhat structured, yet participants have the freedom to introduce new ideas during the interview. They are open-ended in nature, where the questions allow creativity and flexibility. This is because it involves the use of open-ended questions or topics designed before data is collected thereby introducing some degree of flexibility into a study. This could be the reason semi-structured interviews are considered one of the most effective and convenient ways of collecting qualitative scientific data.

4.1 SEMI STRUCTURED INTERVIEWS

The conducted interviews have a semi structure nature. As Tegano George states: "A semi-structured interview is a method of data collection that relies on asking questions within a predefined thematic framework. The questions of a semi- structured interview are not set neither in a certain order, nor in phrasing". In our case the thematic framework is the analysis of the current tools implemented for the purpose of resource planning,

project management, sensitive timeline management etc. In research, semi-structured interviews have a qualitative nature. They are frequently used as an exploratory tool in survey methodology, or other research fields. They are also common in field research with many interviewers, giving everyone the same theoretical framework, but also allowing them to investigate different aspects of the research question.

4.2 ORGANIZATION OF THE INTERVIEWS

Semi-structured interviews are a mix of structured and unstructured interviews. While a few questions are predetermined, the others have a more spontaneous nature. In the conducted interviews, most of the questions were planned, but depending on the response of each stakeholder, the interviews gained an open ended flexible nature. The interviews were relaxed and felt more like a normal conversation. If it was noticed that the answer could serve the purpose of a deeper understanding of the BI implementation, the interviewee was asked to further elaborate on their answers, this frequently done through additional questions that could serve as a guidance for each interviewee to provide some further feedback. The study of these interviews tend to associate the criticism of the current methods as well as the barriers to the adoption of the new BI to the source of the problem. The nature of the interviewees is diverse, not only in departmental terms but also the duration for which they have been in the company, their age, difficulties occurred etc.

The departments involved in the data collection process are:

- Project management
- Fluidical design
- Coils design
- Mechanical design
- Electrical engineering
- Hardware engineering
- Power electronics – Design and production

- Production
- Testing
- Coils & tools
- Systems automation
- Hardware engineering
- Software engineering
- Service, Aftermarket & Commissioning

Most of the interviews lasted around 20-30'. Each interviewee were given the comfort to speak at their own pace. Some people took longer to think about their answers, but the questions were not repeated or reformulated in order to not lead or bias the answers, but in some cases it was needed to probe. The majority part of the interview was written down not to miss any key points raised by the interviewees. The interviews were conducted weekly and sometimes biweekly, due to availability and willingness of participants. The interviewees were asked one question a time, the questions were as neutral as possible, and the answers were awaited with the same approach, in order to not bias the conversation. During the interviewing process, some steps were taken to ensure obtaining a proper conduct.

Some of these pre-set rules were:

- Each interview started with some general questions that would serve to gain insight into the domain of each worker (age, gender, time present in the company etc.);
- Asking only one question at a time;
- Probing more in questions of interest;
- Remaining neutral while awaiting the responses;
- Motivating a calm and slow interviewing state (with the purpose of gaining some time to write down the answers).
- Some of the interviews conducted are attached below. It is to be noted that what is found in this paper, is not the full version of the

interview, but only the main questions/ answers of interest that later served to collect some useful data.

5 THEORY / TOOLS

5.1 THEORY ABOUT PROJECT MANAGEMENT

Prior to understanding the tools used for facilitating the project management, it is necessary to understand the meaning of project management and which responsibilities this role involves. As definied by APM (Association for Project Management): "Project management is defined to be the application of processes, methods, skills, knowledge and experience to achieve certain project objectives within agreed parameters such as deadline of project delivery or budgeted costs. So as above-mentioned, management has deliverables that are limited to a finite timescale and budget. Project management is aimed at producing an end product that will affect some change for the benefit of the organisation that initiated the project. It is the initiation, planning and control of a range of tasks required to deliver this end product".

Gathering, organizing and managing information in an efficient way is crucial for project managers. The flow of information is huge and from various departments, hence organizing it in a comprehensible and efficient manner becomes a necessity. In order to have easy access to various flow of information, there are different system that may be useful. Such systems use one or more software tools for the purpose of information collection, organizing and using project data. Without such a system, it becomes difficult for a project manager to collect data or monitor the ongoing of the project. Project management systems assist not only of collecting and keeping track of the information, but also on various functions such as cost estimation, resource allocation, time scheduling, key performance indexes etc.

5.2 THEORY ABOUT QUALITATIVE RESEARCH

Qualitative research is a method that delves into and offers in-depth insights into real-world issues. Unlike quantitative research, which focuses on numerical data collection, interventions, and treatments, qualitative research generates hypotheses for further exploration and understanding of quantitative data. It collects information on participants' experiences, perceptions, and behaviors, addressing the how and why questions rather than how many or how much. This research approach can be used independently, relying merely on qualitative data, or as part of a mixed-methods study that integrates both qualitative and quantitative data. This review provides an introduction to the fundamental concepts, definitions, terminology, and applications of qualitative research.

Qualitative research fundamentally seeks to answer open-ended questions such as "how" and "why," which are not easily reduced to numerical data. This open-ended nature means that qualitative research design is often more flexible, unlike the more linear and structured approach typically seen in quantitative research. One of the primary strengths of qualitative research is its capacity to uncover and explain the intricate processes and patterns of human behavior that are challenging to measure numerically.

Phenomena such as experiences, attitudes, and behaviors can often be complex and hence require a detailed, nuanced approach to be understood accurately. Through qualitative methods, it is possible to delve into the subjective perspectives of participants, allowing them to express how they think, feel, and experience specific events or situations in their own words. This approach provides rich, detailed data that can reveal underlying motivations and contextual factors influencing behavior.

While there are methods to quantify qualitative data, such as coding responses into numerical categories, the core objective of qualitative research is to identify themes and patterns that provide deeper insights into the subject matter. Attempting to force qualitative data into a

quantitative framework can sometimes strip away the context and narrative that give the data its depth and meaning. Therefore, it is essential to appreciate the qualitative approach for its ability to capture the richness of human experience and the complexity of social phenomena.

In sum, qualitative research offers a powerful tool for exploring the subtleties of human behavior and thought processes. It allows researchers to understand the intricacies of participants' experiences and provides a comprehensive view that purely quantitative methods might overlook. This review aims to introduce readers to the essential concepts, definitions, terminology, and practical applications of qualitative research, highlighting its invaluable role in social sciences and beyond.

6 METHODOLOGY

In the conducted interviews, most of the questions were planned, but depending on the response of each stakeholder, the interviews gained an open ended flexible nature. The interviews were relaxed and felt more like a normal conversation. If it was noticed that the answer could serve the purpose of a deeper understanding of the BI implementation, the interviewee was asked to further elaborate on their answers, this frequently done through additional questions that could serve as a guidance for each interviewee to provide some further feedback. The study of these interviews tend to associate the criticism of the current methods as well as the barriers to the adoption of the new BI to the source of the problem. The nature of the interviewees is diverse, not only in departmental terms but also the duration for which they have been in the company, their age, difficulties occurred etc.

A quantitative interview is designed to help the interviewer understand how one thinks. What is characteristic about these interviews is that the answers are often received through computations, numbers or logic problems. Usually, the analysis of quantitative interview data involves coding response options numerically, entering numeric responses into a data analysis computer program, and then running various statistical commands to identify patterns across responses. On the other hand, the qualitative interviews allow researchers to extract some data from participants' experiences, perceptions, and opinions. Through various open-ended questions, researchers can uncover some more detailed information beyond mere surface-level responses. The semi-structured interview, which is a qualitative research method, and which is the focus of this paper, provides a different approach compared to the structured and unstructured methods. Under this approach, the questions are somewhat structured yet participants have the freedom to introduce new ideas during the interview. They are open-ended in nature where the questions

allow creativity and flexibility. This could be the reason semi-structured interviews are considered one of the most effective and convenient ways of collecting qualitative scientific data.

A summary table describes the departments involved and the number of each department employees involved in the interviewing process. There was a total of 24 interviewed employees.

Departments \ Role	Head of Department	Engineers/ designers etc
Project management	X	
Engineering		
Fluidical design	X	2
Coils design	X	2
Mechanical design	X	2
Electrical engineering	X	1
Hardware engineering	X	2
Power electronics – Design and production	X	1
Production	X	4
Testing	X	2
Coils & tools	X	2
Systems automation	X	1
Hardware engineering	X	2
Software engineering	X	2
Service, Aftermarket & Commissioning	X	1

The method used for conducting semi-structured interviews was face-to-face conversation. Conversational interviewing is more effective at improving understanding. Face-to-face encounters offer a rich spectrum of information that static questionnaires cannot. It can capture more information such as: the nuances of human interaction, the shifts in tone and body language that online surveys do not reveal. This dynamic interplay offers a richer and more accurate understanding of participants' perspectives and experiences.

Furthermore, it is believed that face-to-face interactions significantly boost response rates. From persuasive arguments to addressing hesitations, it can bridge the gap between reluctant participants and insightful data.

However, the advantages extend beyond mere participation. Some of the advantageous reasons for considering face to face semi structured interviews are listed below:

- They can allow to build a connection that unlocks other information.

Here are some key advantages that set them apart from other qualitative research methods:

- Face-to-face interaction allows to build trust between interviewer and participant. Nonverbal communication like eye contact, frowning, nods create a sense of shared understanding and encourage participants to feel comfortable, leading to more open and engaged responses. By analyzing these nonverbal traces, we can gain a deeper understanding of the participant's experience and identify inconsistencies or unspoken truths. Another important reason is that this approach allows the interviewer to adapt the questions based on the participant's emotional state and level of understanding, resulting in a more interesting and fruitful interview.

- We can use probes and spontaneous questions to explore, deepen understanding, and clarify answers to questions, the interviews have a real-time adaptation and follow-up questions. This flexibility enables the interviewer to delve deeper into unexpected avenues that emerge during the conversation and through this interactive approach consequently observe new points of view.

All of the above-mentioned reasons served to allow some understanding of the perceptions of the employees, and also allow for a clearer understanding of when to make additional questions or simulate the participants to have more elaborative answers. The first step taken was to check the organigram of the company to understand the hierarchical structure and choose participants who belong to different areas. The second step was to ask participants for their availability and arrange the interviews accordingly. Subsequently, the interview process followed with all the participants. The open-ended section of the interview addressed

background information of the interviewees or participants and their past experience, this step was seen as a supportive step for the validation of the interview, so it was made clear that each participant could support answers based on an adequate experience in the company (sometimes the participants were involved in more than one department of the company). The first section, following the general background questions, was about the current tools being used for work division in terms of time and resources. The following section was about the ways these tools were used and the opinions of each employee regarding them. This also created an encouraging and friendly environment which improved the confidence level of participants and consequently they were expanding their thoughts. In additional to this, the participants were asked to share their thoughts about the implementation of a new tool and what could be the possible obstacles with he new implementation.

To effectively interpret and analyse the interviews conducted with the company's stakeholders, a color-coding methodology is utilized. This qualitative analysis technique involves assigning different colors to specific themes, concepts, and categories within the interview transcripts. Color coding is a widely used method particularly in qualitative research because it allows for the systematic organization and visual differentiation of data, facilitating the identification of recurring patterns and significant insights. By the use of this method, complex qualitative data can be broken down into manageable segments, making it easier to compare and contrast different parts of the data set.

This method enhances transparency of the data analysis process by providing a clear and visual representation of how data points are categorized and interpreted. It also supports in maintaining consistency throughout the analysis, as each color corresponds to a specific theme or category, thus reducing the likelihood of misinterpretation.

The following section provides a detailed legend for the coding system, outlining the specific colors assigned to each theme or category identified

during the stakeholder interviews. This legend will serve as a reference throughout the analysis, ensuring clarity and consistency as we uncover and explore the key insights derived from the stakeholder perspectives.

In this paper, only some of the conducted interviews will she shown.

- Current method used to assign resources and organize the workload – in blue.
- Satisfaction with the current tool – in green.
- Dissatisfaction with the current tool – in pink.
- Perceptions on a new tool implementation- in brown

7 INTERVIEWS WITH CODING

7.1 INTERVIEW WITH A MECHANICAL ENGINEER

[. . . at the moment the organizational issue is a delicate topic. For our department, we are using Excel. In an excel sheet, we write the names of each resource, their days off, and the respective projects in which each resource is involved . . . It is a well-organized way to note down the days off and be able to see when a colleague is not working on a particular day. . . We can re-organize internally to support the project for the days off. . .]

[. . . It is a well-organized way to note down the days off and be able to see when a colleague is not working on a particular day. . . We can re-organize internally to support the project for the days off. . .]

[. . .I believe implementing this tool would be a great improvement, provided it is simple and user-friendly for everyone. It's important to note that some of our colleagues are quite resistant to changing their established methodologies. Many of them have been using the same methods for years, even decades, so they are naturally reluctant to switch to something new. That's why it is essential that this new tool is intuitive and easy to use, to ensure that everyone can adapt to it without much difficulty. . .]

7.2 INTERVIEW WITH COORDINATOR OF PMO

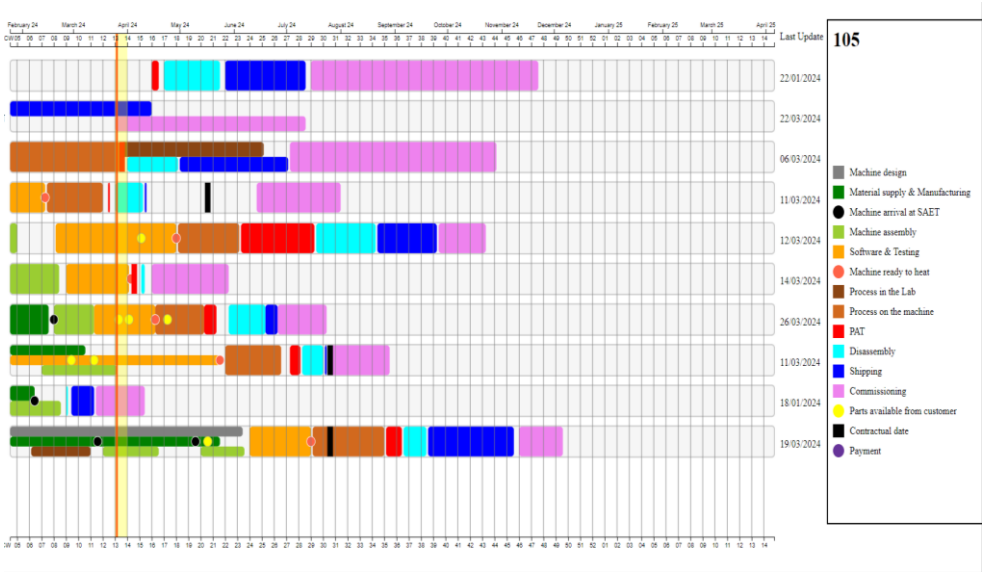
[. . . Whenever we have a new project, I check the availability of each project manager, consequently the project will be assigned to the project manager who has a greater availability for a new project unless they communicate that for any reason they will not be available. We try to stay open for communication and as collaborative as possible . . . There are bi-

weekly meetings, in which we share with each other the ongoing of projects . . . and in those meetings we do discuss also about new awaiting projects and their assignment . . .]

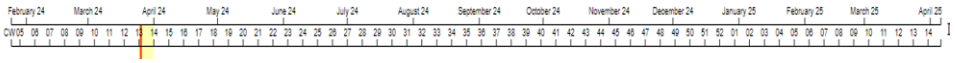
[. . . It wouldn't seem convenient to me that the resources of the projects are allocated by the project manager. Usually, there are many resources involved in each project, it is tricky to know the availability of all of them, but each department can decide how to divide their work internally.

TopGANTT is a tool we use, with the purpose of seeing how the projects are going. From TopGANTT, one can see the job orders' name, the phases in which we are and timing of each phase, as well as some important milestones . . . This tool provides stakeholders with a comprehensive overview of the project's current phase, key dates, and milestones. Each phase of the project is color-coded, enhancing visualization and making it easier to distinguish between different stages at a glance. Milestones are represented as dots, offering clear markers for critical achievements, while the phases are depicted as bars, visually outlining the progression and duration of each segment. This design ensures that all stakeholders can effortlessly track the project's progress and quickly identify upcoming tasks and deadlines. In a much more comprehensible way, it is a MASTER GANTT but open only to be read by the other stakeholders . . . When each Project Manager modifies their GANTT charts, the modifications will be shown on TopGANTT . . . This tool is interactive up to some extent. . .We can set a time window, along with the phase we are interested in and see the projects that we are currently working on, along with their respective timing. Currently, any SAET worker can view TopGANTT, but only the project managers can modify it . . .]

7.2.1 Description of new tool TopGANTT



At the top of TopGANTT, time is displayed in months and calendar weeks, allowing users to monitor the project's status for each specific week and timeframe.

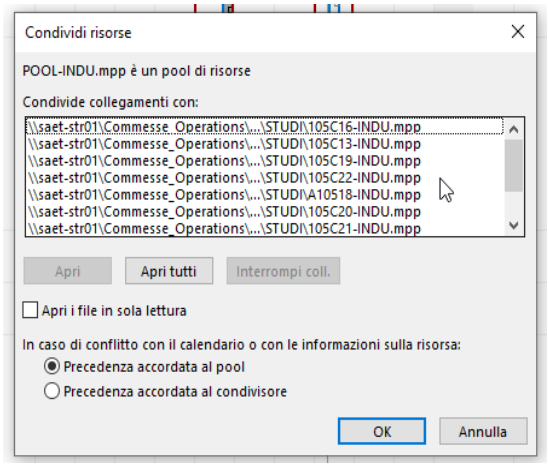


On the right side of TopGANTT, there is a detailed legend that outlines the various phases and milestones of the project, each represented by a specific color. This legend helps users identify and differentiate between the different stages of the project and the key milestones, enhancing the overall clarity and visual organization of the project timeline.

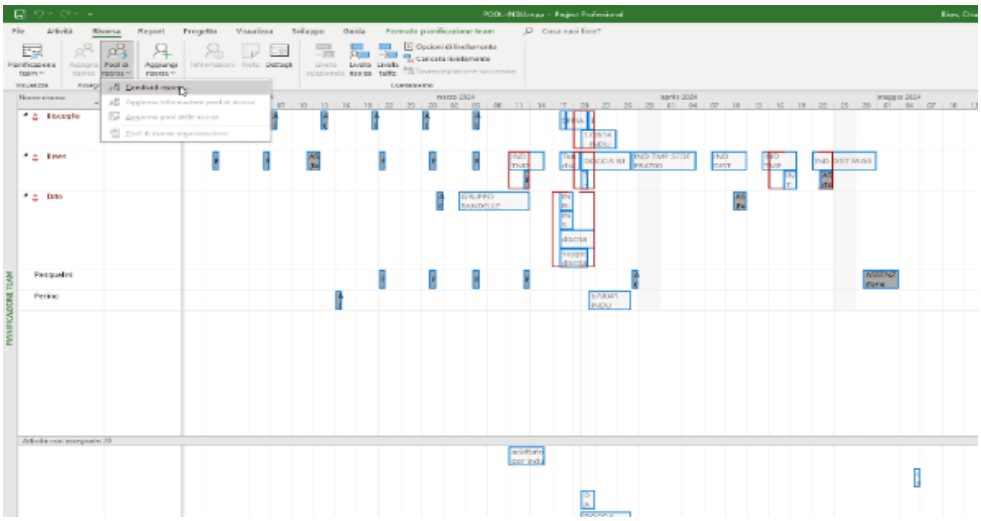
The central section of TopGANTT is dedicated to displaying the projects. Each row represents a different project, showing its phases and milestones. The timeline for each phase is visually linked to the calendar at the top, allowing to easily track its duration. Additionally, by hovering the cursor over any phase, the specific start and end dates will appear, providing a quick and clear way to see detailed timing information for each phase.

7.3 INTERVIEW WITH A COIL ENGINEER

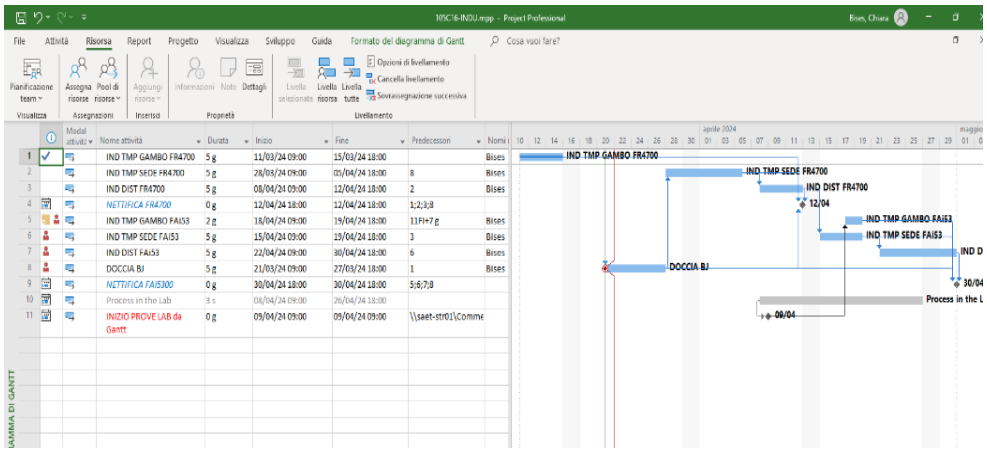
[I've been here for quite some time, so I can tell that at the moment the organizational issue is a delicate topic. . . For our department, lately we have started using Microsoft Project. We have a Resource Pool with our resources and we use it to allocate resources in each project. . . There's a calendar for each resource, so we can view the availability and avoid allocating them in days in which they are not present. . .It seems helpful, I like it that it allows to visualize the availability, and consequently avoid the overallocation. Before that, we were merely adding this info in an excel file, but it was not so efficient, or better said more time consuming, because we needed to check when each of us is not available in order to allocate the project hours accurately. . . I think it's a method that some other departments use as well.]

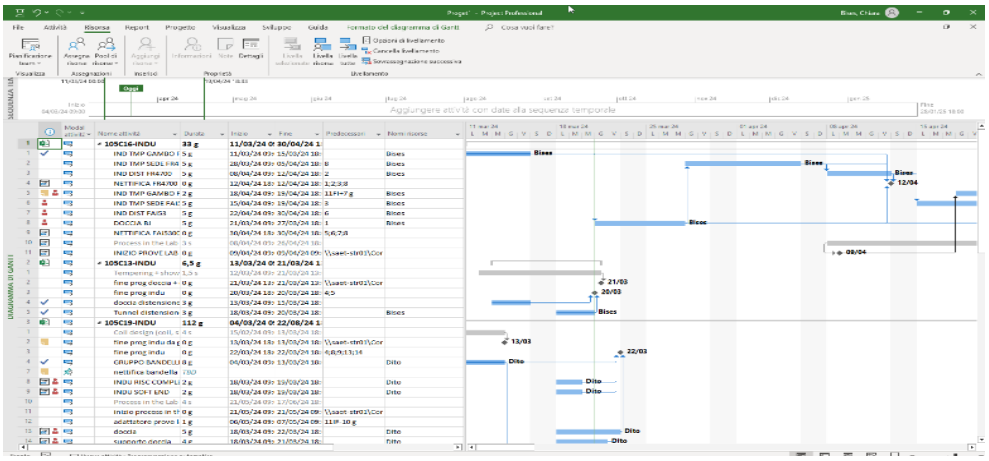


A pool of resources in created in order to list and later assign each resource in the corresponding project



The image above illustrates how resources are overallocated across different projects





[. . .It seems helpful, I like it that it allows to visualize the availability and to avoid the overallocation. . . Before that, we were merely adding this info in an excel file, but it was not so efficient, or better said more time consuming, because we needed to check when each of us is not available in order to allocate the project hours accurately. I think it's a method that some other departments use as well. . .]

[. . . Based on my understanding, the company is working on developing a new solution aimed at standardizing the way we allocate resources. This

tool will enhance our ability to visualize the ongoing progress of projects, track the different phases, and identify any unavailability of resources. At the moment, the transition seems challenging because each department has its own methods, and some employees feel that they don't need this new tool since they are already managing their work efficiently within their own systems. However, I think this new tool is a fantastic idea. It will provide a clear overview of resource allocation across the board. This is especially useful because, currently, if the same resource is needed for different phases of a project, I have to personally go and ask around to check their availability. This manual process feels a bit outdated and consumes a lot of time. With this new tool, we can all see who is assigned to what task at any given time, streamlining our workflow and saving us from unnecessary interruptions and time wastage. . .]

7.4 INTERVIEW WITH A TESTING ENGINEER

[. . . I've been here for quite some time, so my role has changed too. I was working in the testing part among 3 other people. Now I'm working as the head of this department, so I'm in charge of organizing the work among the other resources, as well as supporting them with the testing phase in a more technical way in various projects. . .This is not well structured among us. . . This method feels really old-fashioned and just doesn't work well for our team anymore. It's not efficient enough and doesn't have the tools we need to get our work done properly. Our projects are more complex now, and we need something more up-to-date that can help us work better and faster together. The way we're doing things now just isn't cutting it. I think that lately the company is trying to make some changes over that topic, but it seems tricky for the moment. . . in our department, we organize the work division merely by writing in a board the name of the job order, and the resource who will follow it. . . When the resource communicates to me that they will not be available (because of vacations, other projects

overload etc), I allocate the new project to another resource. . . Then, for the ongoing of the project we write in the board the weeks and the tasks to be completed within the week. . .]

I think adding this tool would be a big help, as long as it's easy for everyone to use. We need to remember that some of our coworkers might be slow to change how they work. Many of them have been using the same methods for years, and they might not want to switch to something new. . .To help with this, the new tool should be really simple and straightforward. Everyone should be able to learn how to use it quickly. We should also offer plenty of training and support to make the switch easier. If we explain how the tool can make our work faster, keep track of projects better, and improve communication, more people will see its benefits. . .It would also help if we involve some key team members in creating and testing the tool. This way, we can make sure it fits our needs and get their feedback early on. This will make everyone feel more comfortable and positive about using it. In the end, this tool can make us more productive and help us work together better, but it needs to be easy to use and we all need to be willing to give it a try.

8 RESULTS

8.1 CURRENT TOOLS USED BY EACH DEPARTMENT FOR RESOURCE ALLOCATION AND WORKLOAD ORGANIZATION

For the analysis of the current tools used in the company, the feedback received from all the departments was that there is currently a diversity of tools used, and no standardization among departments. A mechanical engineer, and a power electronics engineer informed that the method they use to note down the days off or to assign resources internally is Excel.

Regarding the PMO department, as a result of a less dense team and a constant communication among all of the project managers, the one to follow a new project is assigned through a more direct and collaborative way.

For the analysis of resource allocation among the coil engineers, the interview was conducted with the head of the department and it was stated that the current tool they use is Microsoft Project. It was depicted that this tool seems to be more efficient than the previous tool they were using until not so long ago (Excel). Microsoft Project, as a result of various functionalities, it seemed to be a more appropriate tool to be employed in this task. As it was explained, a pool of resources was created and it was later linked to various projects where the department is involved. Each resource is allocated in the project where they are currently working, depicting the corresponding time window. In the same pool of resources, each resource has their respective timetable that include the days off, holidays, personal occupations etc.

During the interview with a resource from the Testing department, it was noted that they don't use a particular tool for resource allocation and work scheduling, but they do rather use a simple method of taking note of who does what.

8.2 PERCEIVED GAINS IN CURRENT TOOLS

During the interviewing process, each interviewee was asked on how they perceive the current tools being used. They were given enough space to elaborate further on what could be improved/changed. It was noticed that most of the stakeholders stated that the tools they use are good enough for collecting data, but it was followed by criticism. Most of the interviewees stated that the present instruments are not complex enough to allow space for new functionalities or features. Some of the feedback is stated below.

A mechanical engineer, and a power electronics engineer informed that in Excel they can assign resources effectively.

The feedback received from the Project Manager was that the actual method applied in the PMO department works well for the project managers, while adding that according to them, the same doesn't stand true for the other departments, which need a more effective way due to the fact that there are more resources and it can become tricky to arrange the work in a simple and old-fashioned way. During this particular interview, another interesting fact came up. It was mentioned that the company is trying to implement a tool that can standardize the methods of allocating resources. Until now this tool named TopGANTT is being used with the mere purpose of visualization of the ongoing projects (to see the actual phase of the project). The company is trying to add a new functionality on this tool, but for the moment it is only an idea that does yet need to be further elaborated and discussed with each department.

Additionally, the feedback received from the coil designer is that the method used works well compared to the old version.

8.3 PERCEPTIONS ON NEW TOOL IMPLEMENTATION TOPGANTT

Each interviewee was asked some further feedback about Top GANTT or any other new tool to be implemented with the aim of improving the efficiency of the projects regarding resource allocation. Most of the interviewees stated that even though the new tool can be helpful in terms of standardization and resource over-allocation, can possibly not be welcomed by some members of the team. This due to the fact that the current methods have been going on for a long time and some resistance may occur with the shift of methods. Some of the employees do prefer the status quo and prefer to avoid change, the changes from the implementation of new systems could possibly generate resistance.

9 DISCUSSIONS OF RESULTS

Reaching out to people in the study areas was generally straightforward. Everyone was very cooperative and willing to answer the questions. Before the interviews, we asked participants about their availability to ensure we scheduled the interviews at convenient times, avoiding any disruption to their work. This helped to conduct the interviews smoothly and efficiently.
In the above-documented interviews, tons of information were collected regarding the current tools that are used in the company in order to organize the projects/workload. The interviewees belonged to different departments, with the mere purpose of collecting data that is diverse and able to complete the full picture of the organizational topic in the company. Most of the conducted interviews had a positive feedback in terms of extraction of useful data. Since some of the approaches were quite similar/ repetitive, it was found more reasonable to attach here only some of them with the aim of giving a general idea on this paper.
The interviewed employees are not only part of different departments and different job positions, but also have been in the company for a different amount of time, belong to different age groups, different gender etc. This with the main goal of increasing the diversity of the answers and comments that were obtained and to not restrict them to any particular group or viewpoint.
Each interviewed worker was asked about the current tool that they personally use to organize their own work or the work of their respective group. During the interviewing process, due to a more flexible nature of interviewing, when it was noticed that the answers could allow a further explanation that would help to gain some knowledge, the questions were built in such a way that more information could be extracted. In most of the interviews, it was asked to further explain why the current tool does not satisfy the organizational needs of each group, what could be improved and so on.

It was noticed that most of the stakeholders agree that the current tools implemented are good for visualization and some guidance regarding the resource allocation matter through the projects, but it was agreed that they are not sufficient.
It was noticed that many employees consider the integration process with the current systems to be a difficult step that needs to be dealt with in a careful manner. It is also perceived that this step may take some time and a lot of testing before the actual implementation of the new tool.

Most of the workers use their own particular methods for allocating resources, currently most of them use excel for noting the days off, and by looking at this info, they allocate resources accordingly.
The majority of the workers agree that there is space for improvement in the current tools that the company uses.
Most of the interviewees think that despite the fact that there is need for improvement in the currently used tools, the implementation of new tools/methods in the company would face some resistance by a certain group of people, who would disagree with the benefits of it. Along with this, it is also believed that if the tool is not easy to use, the adaptation of it would face a bigger resistance, considering that the workload of many resources is heavy and there is not enough incentive to make some effort for learning to use a new tool.
It was stated that TopGANTT tool could be used to add this functionality, and is agreed that since the tool is already familiar for the majority of the team, the implementation of a new feature in TopGANTT would be more welcomed than the implementation of a brand-new tool. One of the concerns among stakeholders is that implementing the new tool and getting everyone to use it properly will require significant training, which will take time and effort. They worry that learning how to use the tool effectively might be challenging and could take away from their regular work responsibilities. This concern highlights the need for adequate

preparation and support to ensure a smooth transition from the current tools to the new one.

Most of the stakeholders were aware of the fact that the current tool is going through same changes, in order to include other functionalities that now it does not possess. Some of the stakeholders were supportive of the proposed changes and had a clear understanding of what these changes involved. They were ready to collaborate and embraced the new direction. On the other hand, there were stakeholders who had different perspectives and did not fully grasp the details of the changes. These individuals are prone to be less cooperative and lack a positive attitude towards the new initiatives. Their reluctance to adapt could make the process more challenging.

10 DISCUSSION

Most workers currently use their own methods, often relying on Excel for resource allocation, particularly for tracking days off. Others use Microsoft Project. They agree that the current tools could be improved. While many acknowledge the need for better tools, they anticipate resistance from some colleagues who may not see the benefits or find it difficult to adapt. There is a consensus that any new tool must be user-friendly to overcome this resistance, as heavy workloads leave little incentive to learn complex systems.

Stakeholders believe that enhancing the existing TopGANTT tool would be preferable to introducing an entirely new system, given their familiarity with TopGANTT. However, they are concerned that implementing these changes will require significant training, which could be time-consuming and detract from their regular duties. Thus, thorough preparation and support are necessary to ensure a smooth transition.

While some stakeholders are enthusiastic about the proposed changes and ready to cooperate, others are skeptical and less willing to adapt, potentially complicating the implementation process. The feedback from employees at this middle-sized metallurgical company reveals a need for better resource allocation tools. Currently, many rely on Excel, which is seen as outdated. There is a common thought that improvements are necessary, but there is also an expected resistance to new tools, especially if they are complex and require significant training. Some stakeholders are open to change, while others are less cooperative, preferring existing methods.

Upgrading current tools like TopGANTT, rather than introducing completely new systems, could minimize resistance. New tools must be user-friendly to ensure quick adoption and minimize training time, considering employees' heavy workloads. Effective change management

strategies, including clear communication of benefits and comprehensive training, can be crucial to overcoming resistance. Early and active involvement of stakeholders in the implementation process can help mitigate concerns and welcome a collaborative environment.

Some of the limitations of this research are:

- Limited Sample Size: Feedback is from a small group within one company, which may not represent the broader industry.
- Subjectivity: Responses are subjective and may reflect personal biases or reluctance to change.
- Context Specific: Findings are specific to this company and may not apply universally to other companies or industries.
- Underestimated Resistance: Actual resistance to new tools might differ once implementation begins.
- Implementation Challenges: Practical issues like cost, technical support, and maintenance were not deeply explored and they are different for each company.

Future research should address these limitations for a more comprehensive understanding and successful implementation of new tools.

11 CONCLUSIONS

This paper addresses the research question: What are the Critical Success Factors (CSFs) for Business Intelligence (BI) implementation in the metallurgical/manufacturing sector. This is explored through a case study of a mid-sized company located in Turin. A qualitative approach was employed to gather insights from various stakeholders within the company. Semi-structured interviews were conducted face-to-face, allowing for a better understanding of the current tools used by each department, the feedback on these tools, and the stakeholders' perspectives on implementing a new tool. These interviews also helped identify the factors necessary for a successful implementation of the new tool. The gathered data provides a detailed view of the existing practices and the potential improvements that can help effective BI implementation.

The feedback indicated that the current tools for organizing work and resources, such as Excel and Microsoft Project, are not effective for a project-oriented company in the metallurgical/manufacturing sector that handles numerous projects. This inefficiency makes it difficult to manage resources and prevent overallocation. The company has begun implementing a new tool that was developed in the company that currently provides visibility into the status of each project and is being considered for adding resource allocation functionality. Stakeholders have varying perspectives on this initiative. Improving current tools like TopGANTT instead of creating new ones can help reduce user resistance. From the feedback received, it was stated that new tools should be easy to use to make adoption faster and require less training, especially since employees have heavy workloads. Good change management, which includes clearly explaining benefits and providing thorough training, is important to overcome resistance. Involving stakeholders early in the process can help address concerns and create a cooperative environment.

Some stakeholders are eager to support the proposed changes and willing to collaborate, (especially when the changes are implemented by starting with an existing tool) while others are less open to adapting, which could make the implementation process more challenging. The feedback showed that responses depended significantly on the interviewee's age and how long they had been with the company. Those who had been there for a long time and were older were often less willing to change their work methods.

The feedback has some limitations, including being based on a small group within one company, which may not reflect the wider industry. Responses are subjective and could show personal biases. It is to keep in mind that these findings are specific to this context and may not apply to other companies. Additionally, the actual resistance to new tools might be caused by practical issues such as costs and support that can be different for other companies in the same sectors. Other studies related to this topic do not provide enough data because they don't focus on this type of company or its specific size. Thus, this research offers valuable insights and can surely serve as a foundation for further studies.

12 BIBLIOGRAPHY

Craig Stedman on Business Intelligence, URL:

https://www.techtarget.com/searchbusinessanalytics/definition/business-intelligence-BI

Cam Merritt on middle-sized companies (Updated March 08, 2019)

URL: https://smallbusiness.chron.com/size-company-considered-midsize-company-71776.html

Tegan George on semi- structured interviews published on January 27, 2022, URL: https://www.scribbr.com/author/tegan/page/5/

By APM Body of Knowledge 7th edition on project management, URL:

https://www.apm.org.uk/resources/what-is-project-management/