DOCUMENT TITLE:

GOOD PRACTICE REPORT FROM SLOVENIA

Project: Improving RD and business policy conditions for transnational cooperation in the manufacturing industry

Acronym: Smart Factory Hub

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Dissemination level		
PU	Public	
PP	Restricted to other Programme participants	
RE	Restricted to a group specified by the consortium	
CO	Confidential, only for members of the consortium	X

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TARGET GROUP ASSESSMENT

Has this deliverable addressed any of the target group indicated in the application form?

Yes / No

If yes, please describe the involvement of each individual target group in the table below.

Target group	Number reached by the deliverable	Description of target group involvement
SME	*7*	Good practices collected from the following SMEs: • Impol group • Solopex d.o.o. • Inden d.o.o. • ININ d.o.o. • Medicop d.o.o. • Titera d.o.o. • Elmitel d.o.o.
Regional public authority		
National public authority		
Higher education and research		
Business support organisation		

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1 INTRODUCTION

Regional Good Practice Report for Romania contains five good practices collected using the Good Practice Template developed in D4.2.1.

The data in this report was collected during September – December 2017 as part of the project entitled "*Improving RD and Business Policy for Transnational Cooperation in the Manufacturing Industry – Smart Factory Hub (SFH)"*.

These five examples are the basis of the regional report, the Handbook tool report and the Good Practice Handbook, which together with the Mapping tool will allow project partners to present and promote specific smart manufacturing solutions. Based on the collected data, the Handbook tool report will be prepared by the UTC-N, WP4 leader.

The handbook will be available in electronic format on the web portal, while, for disseminating the work package, also 250 handbooks will be printed, which will be available to the participants at the closing dissemination event.

The data collected during this period will also be used for ex-ante evaluation.

PTP collected the following good practices cases:

Table 1: The list of good practices from Slovenia

No.	Name of the Good Practice	Classification[1]
1	DIGITALISATION OF HRM IN IMPOL GROUP	HRM system digitalisation
2	SOLOPEX SOLO – PERSONALIZED INDUSTRIAL INTELLIGENCE TOOL	Cloud processing
3	INFRAME SYNAPSE MES: EFFECTIVE ENTRY INTO IT-BASED MANUFACTURING	Cloud processing
4	AUTOMATIZATION AND DIGITALIZATION OF PRODUCTION AND BUSINESS PROCESSES	Cloud processing
5	HEATING UNDER GLOVE FOR WORK IN EXTREME ENVIRONMENTS	Smart materials
6	E-VINEYARD – VINEYARD MANAGEMENT SOFTWARE	IoT solution

[1]According GOOD PRACTICE GUIDELINES

2 GP1: DIGITALISATION OF HRM IN IMPOL GROUP

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Keywords : HRM digitalisation, Industry 4.0
Good practice applied in: (NACE code) : J63 - Information service activities; J62 - Computer programming, consultancy and related activities

In line with the guidelines of Industry 4.0, the transition to business brings a number of challenges also in the field of human resources management, where the increasing needs for knowledge management, competence development and the management of the complexity of changes are emerging. For this purpose, the human resources development field also needs agile solutions that effectively support strategic management functions with human resources.

2.1 GOOD PRACTICE DESCRIPTION

The Impol Group decided to develop the personnel information system, following the following goals: to ensure the corporate management of a complex business group, to follow the requirements of the corporate strategy of Industry 4.0 and to provide strategic management of employees.

With the help of the new information system HRM 4.0, the Impol Group has the appropriate platform for managing the complexity of human resource management. The new information system enables the development of personnel through targeted management, monitoring of activities, competence development, knowledge management, performance measurement (360-degree appraisal), monitoring of company dynamics (measurement of organizational climate, questionnaires, forums), promotion of innovation reporting of useful proposals, innovations), mastering the field of occupational safety (records, medical examinations, work accidents, incidents) and giving feedback. The IT solution also enables every employee access to the application with the help of a smartphone, thus promoting personal development, two-way communication, building affiliation and simplifying data management.

The solution was developed for dedicated requirements in IMPOL group and therefore it is not possible to directly compare the solution with competitors.

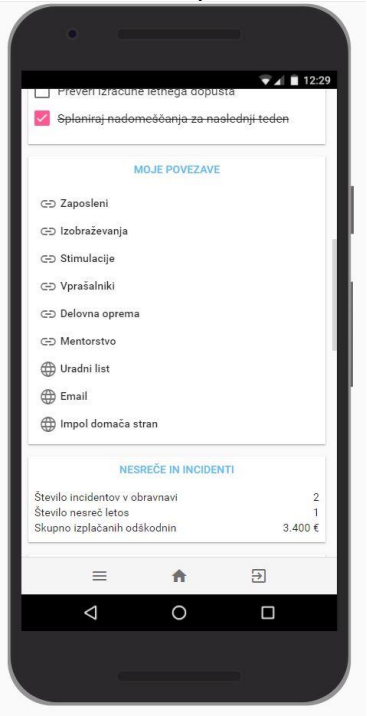

Figure 1: IT solution enables tracking via Smartphone

2.2 OBJECTIVE AND TARGET AUDIENCE

The solution where good practice has been tested and validated is Slovenia.

Advanced analytics enables the up-to-date monitoring of key personnel development indicators while at the same time the system through its interconnectivity with key institutions (Employment Service, Health Insurance Institute) greatly simplifies administrative processes and reporting processes. Target group for this good practice are SMEs, Large companies and public institutions.

2.3 METHODOLOGICAL APPROACH

The solution is software based and as such very cost effective. The solution is providing data that can be incorporated to existing quality assurance systems and existing risk management systems. To implement the solution in a company it is required to outline the functionalities to be used. The implementation itself is technically not very challenging but focus to internal training of personnel using the system in organisation is important. Implementation of IT solution does not require many resources.

2.4 VALIDATION PROCESS

The validation was done by HRM responsible persons in IMPOL GROUP. The process was performed while development of the product and several people has been involved.

2.5 RESULTS / IMPACT

The application itself will bring the following benefits:

- saving time for data processing,
- saving time for data entry,
- reduction in the number of transmission errors,
- increasing transparency of data,
- improved control of events in organizations.

Career management tools will enable employees to:

- raising the commitment of employees,
- raising the membership of employees,
- raising the productivity of employees,
- reduction of work incidents.

HRM 4.0 offers the following benefits as a smart service:

- Improves the state of knowledge and the possibility of more efficient and successful management of employees and their rewards, motivation etc...,
- supports the lean business of organizations, since it makes it easier to manage data and knowledge of employees,
- Provides added value for users with reminders, predictions and skills for future planning.

2.6 SUCCESS FACTORS AND CONSTRAINTS

No major limitations identified. Larger companies are aware of HRM processes and are searching for IT supported systems to automate data collection from employees related to satisfaction on working place, productiveness, education, trainings and other HRM related relevant data.

2.7 LESSON LEARNED & SUSTAINABILITY

With the development of the HRM 4.0 application, the following knowledge was acquired at three levels:
a) Implementation level: Process knowledge, how to approach application development,
b) content level: The application comprehensively lists the basic processes in the personnel function, with emphasis on the specifics required by the manufacturing companies,
c) Structural level: The application provides a framework within which organizations can store their knowledge.

The solution is software based and all relevant data are stored in databases. The data is collected regularly and the database will grow with time. Sustainability as such is given by the use of relevant data collected.

2.8 REPLICABILITY AND UP SCALING

The process openness of the application also enables the use in other organizations, and therefore a marketing application distribution strategy was created, which will cover the costs of development and will provide the basis for further upgrading of the functionality. In this context, we can, for example, with the application; they helped primarily small and medium-sized enterprises in the management of human resources, based on the use of smart solutions.

The solution can be further integrated to other existing systems in the company to provide more insights and better information's for taking HRM related decisions that can influence the total productivity in the company.

2.9 FINAL REMARKS

The solution described can only support the company strategy if integrated properly to existing HRM and management decision processes. The solution cannot be a substitute for required professionals that will take decisions but can support them to collect relevant information faster and take decisions based on such information in a more exact way.

Disclaimer / Acknowledgements

No legal constrains.

List of attachments:

- **Attachment1: HRM system overview**
- **Attachment2: HRM system overview**

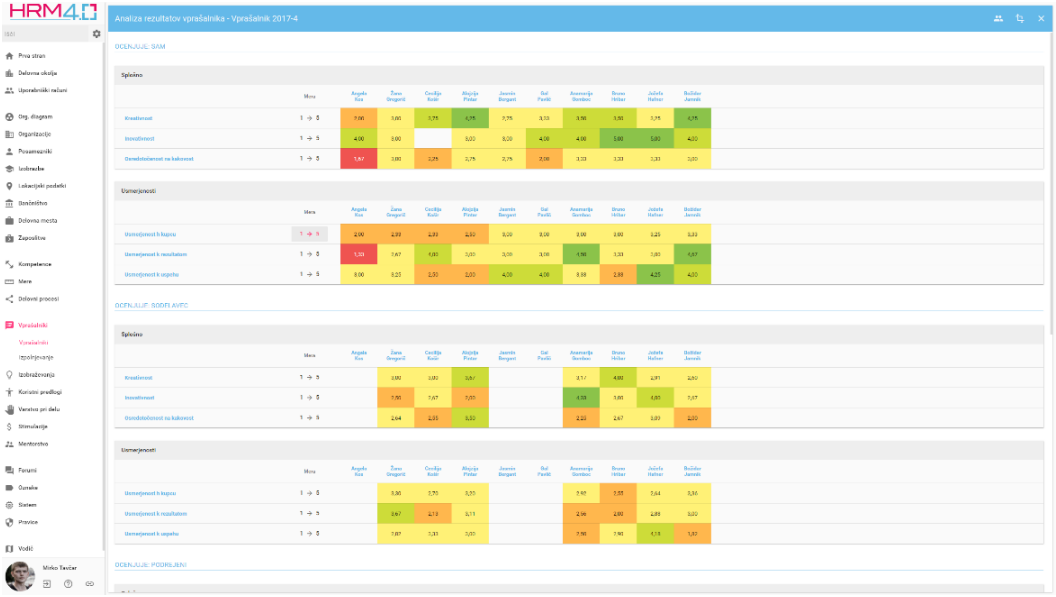

Figure 2: HRM system overview

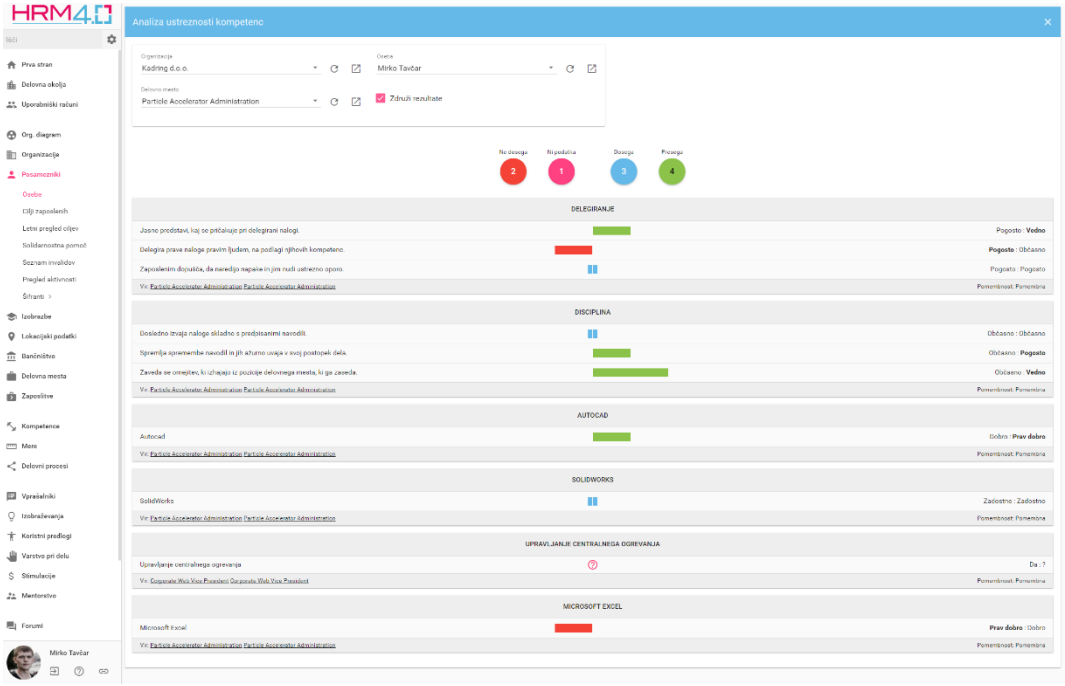

Figure 3: HRM system overview

3 GP2: Solopex solo – personalized industrial intelligence tool

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Keywords : Industrial AI, IoT solution, Supply chain
Good practice applied in: (NACE code) : C22 - Manufacture of rubber and plastic products; C24 - Manufacture of basic metals; C25 - Manufacture of fabricated metal products, except machinery and equipment

IoT solution for production company operating in high-dynamic supply chain (automotive industry or similar high-demanding and fast-paced industry). It is especially applicable for those from steel, plastic and tooling industry.

3.1 GOOD PRACTICE DESCRIPTION

The founders of the Solopex have ideal set of skills to create this product and ensure success in the market. The team have following members:

- Industrial IT Specialist (Manufacturing, telecommunications,…)
- Optimization Expert (Statistics, engineering,…)
- Serial Entrepreneur (30 years of experience in tooling and founder of 9 companies)

The solution is tied to increasing the efficiency of production processes.

SOLO is the ultimate tuning add-on for industrial IT systems. It enables manufacturers to take the best planning decisions for organizing complex tasks on and off the shop floor. SOLO plans tasks like material preparation, production scheduling, workforce allocation, and warehousing optimally at the push of a button. SOLO combines the power of the cloud with a high-end decision optimization engine. SOLO is accessible as a SaaS product via REST API, integrating easily with any system infrastructure. It does not disrupt existing processes and adjusts to the current data situation.

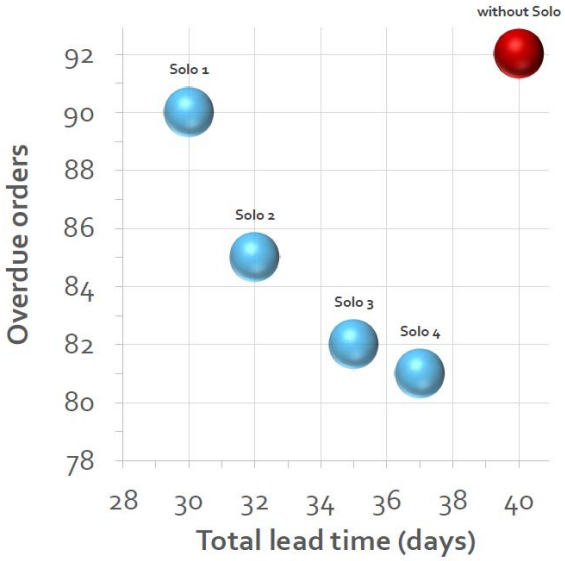

Figure 4: Measurement and increase in production with and without SOLO

Our solution is already taking into consideration next step of Industrial revolution (Industrial AI). It is also noted that our solution can be ready in less than a month, while it is not disrupting the manufacturing process. Another plus is also subscription based fee, which is not presenting too high investment related issue for the company.

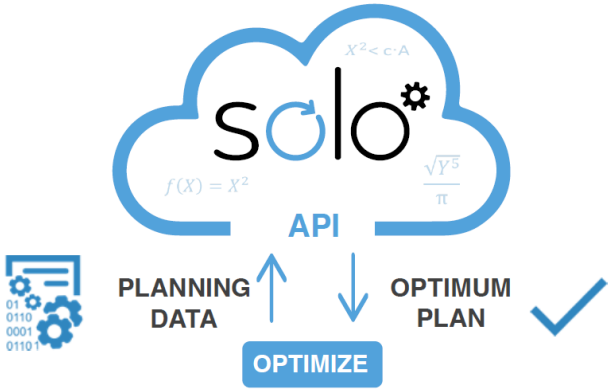

Figure 5: Solopex SOLO API

3.2 OBJECTIVE AND TARGET AUDIENCE

The good practice is in early phase of adoption, where it was first tested with 4 pilot cases in Slovenia and Croatia. The further implications were done in Slovenian and Croatian companies, while solution is actively marketed in DACH regions, where future step would be to enter the market of USA.

Figure 6: Number of target customers

Ideal customer:
Two sizes:

- Company size 1:
  - >100 employees
  - >25M annual revenue
  - Growing, ideally more than 20% annual growth during last 3-5 years
- Company size 2:
  - >500 employees
  - >100M annual revenue
  - Growing, ideally more than 5% annual growth during last 3-5 years

Targeted customer are both SMEs and Large companies.

3.3 METHODOLOGICAL APPROACH

Solopex SOLO saves manufacturers time and money: Planners save time by planning production-related tasks at the push of a button. SOLO computes plans that minimize wastage, overall production time, and space use in warehouses. Compared to manual processing, savings of 15% and more can be achieved for dedicated planning tasks. With SOLO's monthly subscription model, this leads to an immediate return on investment and a lasting increase in profit margins.

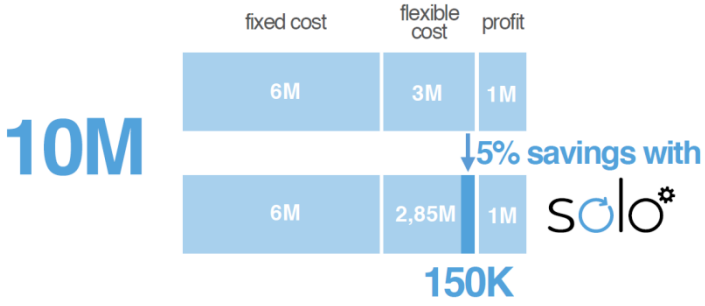

Figure 7: Solopex SOLO savings

Many industrial manufacturers organize production-related tasks in a manual or semi-automatic way. Human planners apply best-practice approaches or thumb rules and rely heavily on their experience. This works fine until the planning situation reaches a certain complexity, at which the human mind becomes unable to process all possible alternatives. Consequently, crucial

performance indicators like material yield, machinery uptime, and system throughput drop and reduce business efficiency.

Taking the best planning decisions and being able to immediately react to changes and unexpected events in daily operations allows industrial clients to manufacture their products at the highest possible speed and to utilize their resources in the most efficient way.

Following procedure is used when implementing our solution:

1. Analysis: Analysis on how the production processes are planned (5 days)
2. Packaging into SOLO: design of algorithms which finds better planning decisions and package this algorithm into SOLO (10 days)
3. Interface: Finally, the integration to the client system is done. (3 days)

By that whole process takes less than a month and it gets quicker with every new client.

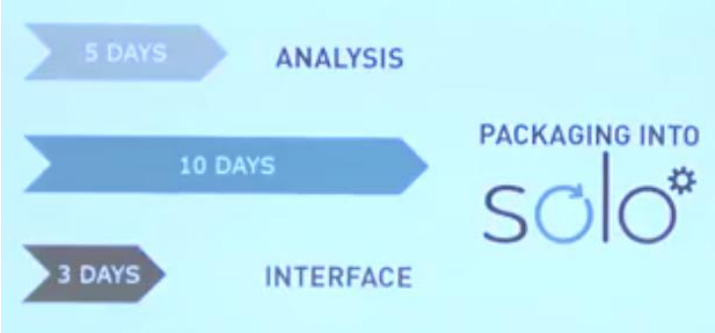

Figure 8: Implementation procedure

Resources involved:
- 3 experts who are engineers, computer scientists, and mathematicians.
-Solution can be ready to use in 3 weeks (1 week analytics, 2 weeks design and implementation)
-Analysis is for free, while implementation is based on customer requirements

3.4 VALIDATION PROCESS

The validation process was completed within the customer factory where comparison between results before and after implementation was done.

3.5 RESULTS / IMPACT

Following results can be achieved while implementing the good practice:

- Solopex Solo is providing strictly better planning decisions in a fraction of the time (1min vs 15min)
- With goal prioritization, Solo can be adapted to the client's most pressing needs
- In the overload situation that the client is in, a good strategy is to minimize lead times (Solo 1) in order to get shop floor operations back to a normal state
- In normal operations where sales are mostly within production capacity, the primary goal should be on-time delivery (Solo 3 or 4).

3.6 SUCCESS FACTORS AND CONSTRAINTS

No specific limitations were noted while implementing the solution. Specific attention should be given to the persons involved in the process of implementation, since IT knowledge is of a special importance, whereas usually processes are run by experienced experts, who lack knowledge of computer science.

Following selling points are important:

- Gain in process efficiency of 15% or more, while saving hundreds of Euros and hours of processing time
- Rapid return on investment
- Lasting increase in profit margins
- Integrates easily with existing IT infrastructure
- Does not disrupt existing processes
- Adjusts to current data situation
- Can manage unexpected events

3.7 LESSON LEARNED & SUSTAINABILITY

Solo can be adapted to the client's most pressing needs. There is always human factor involved in this process, whereas it is important that production managers are prepared for this step and are looking into same direction as management of the company.

The production all over Europe and world is moving into digitalization of processes into so called Industry 4.0, where Industrial AI, which is a basic of Solopex Solo represents the most advanced part of this transformation. This is why we see our product as a sustainable in the current market.

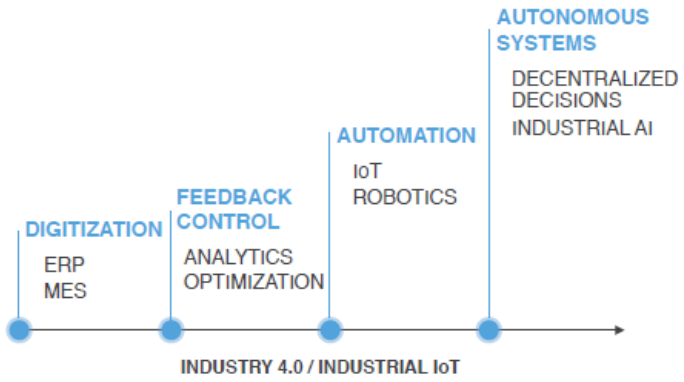

Figure 9: Industrial AI in future autonomous systems

3.8 REPLICABILITY AND UP SCALING

SOLO has been designed for manufacturing companies in steel, plastics, aluminum, tooling, chemical, and electronics industry. This is why it can be easily transferred to any of these production oriented companies. So far there are no special plans on widening the scope, as we

first want to start with implementation on a big scale, after that we will focus on further development of our solution.

3.9 FINAL REMARKS

The Solopex SOLO offers customer tailor made solution to their specific production process needs, where it integrates easily with existing IT infrastructure of the customer. While implementing the solution the process is not disrupting the existing production processes so the costumer is not facing any production loss or loss of income. The start investment is easy to carry on, as it is based on subscription fee and is not representing too much of a burden for the customer.

Disclaimer / Acknowledgements

No limitations and it can be used for dissemination.

List of attachments:

NA

4 GP3: InFrame Synapse MES: Effective entry into IT-based manufacturing

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Keywords : Production and process data acquisition, direct entry in tracking & tracing
Good practice applied in: (NACE code) : J63 - Information service activities

Digitization and computerization of business processes through the implementation of dedicated information systems and automated data acquisition and processes is today key to maintaining and increasing competitiveness. The project gave the experience of the 4th industrial revolution of first hand and a tangible experience of how digitalization has a direct impact on production.

4.1 GOOD PRACTICE DESCRIPTION

Own development together with partner companies.

In the first step functional specification of software solution based on client's expectations, requests and analysis of the situation is written. Functional specification includes listing all functionalities and defining data model of the new software solution. We offer support of our experts' wide range of knowledge and experience in fields of business, industry and energetics when designing content of the solution.

In the second step code planning and development is executed. We use modern and up-to-date business application software architecture and Microsoft (.NET and MS SQL) environment. Outcome of code development is web-based application that can be hosted in the cloud which guarantees high level of reliability and data security or hosting can be set up on client's server.

In the last step of information systems' development cycle, software implementation at the customer is done. To ease the transition to new information system, educational workshops are organised. While the system is up and running clients are provided constant maintenance and application support. Successfully finished project follows phase of maintenance and possible upgrades where we offer content and technical assistance.

Complete data collection at a surprisingly low price. The solution is modular, scalable, and tailored. It scales with needs of production. The InFrameSynapse MES mini can grow with customer requirements. It can be scaled to a mature InFrame Synapse MES if needed. As an easily embedded solution for Tracking and Tracing needs, the InFrame Synapse MES mini certainly is a worthwhile investment.

Figure 10: Synapse MES mini solution

The solution is better than competition because it developed in the giant semiconductor industry, the white goods industry and the automotive industry, which had clear demands and a vision for the future. These are today completely digital factories and part of their solution is also our solution. The solution is designed to be updated every 14 days - as a result, the solution always complies with the latest guidelines.

4.2 OBJECTIVE AND TARGET AUDIENCE

The target group of good practice are all companies that have discrete production in their establishments. The size of companies that are suitable for the implementation of good practice or solution starts with 30 to 50 employees in production.

4.3 METHODOLOGICAL APPROACH

Small and medium-sized manufacturers benefit from a production, which is consistently IT-based to be controllable and schedulable. In the past, the introduction and maintenance of such Manufacturing Execution Systems (MES) have been associated with great effort. With InFrame

Synapse MES mini, the SMEs can get the transparent and process-oriented view onto their production. Production data are processed and available for further process optimization.

Better overview of production process and available data are supporting existing quality management systems and quality assurance by providing relevant information for further decisions and actions. Better overview of production process and available data are reducing the potential risk and in general supporting the risk management process.

If a business considers data collection and analysis to be most important, a mature high-volume MES would be too complex and expensive. InFrame had these thoughts in mind and came out with InFrame Synapse MES mini which is a “stripped down” MES for SMEs and their entry into the IT-based process optimization. This version is simply a Manufacturing Execution System without the “Execution”. Nevertheless, the InFrame Synapse MES mini offers complete production and process data collection, plus a cost-effective entry into productive tracking and tracing.
The implementation requires a person from customer who is capable of describing all production process and is actively involved in scaling up the solution. The whole process is usually done within a month, while the finances are not of a big scale as we are usually preparing the solution for specific customer needs, so also the finances are being discussed with customers from case to case.

4.4 VALIDATION PROCESS

Validation of implemented solution is done by existing team in the company that was responsible for production already before implementation. More sophisticated information and details provided are critically evaluated and validated to get an approval from customer top management.

4.5 RESULTS / IMPACT

Through control and greater transparency of production, bottlenecks, deviations from the predicted quality levels (through monitoring of parameters) can be identified, error types and analysis are monitored, real-time alarms are sent to the responsible person on smart devices (also the possibility of analysing alarms, frequency ranges, depending on a particular machine or operator, etc.), through various industrial indicators (most often, indicators such as the total efficiency of devices or OEE for monitoring the performance of devices are exposed). It is possible to obtain an additional dimension of production, to control material consumption and consequent reduction in waste, which helps to reduce costs directly. It is also possible to control the operators in production. Added value is flexibility, control and visualization of events in production.

4.6 SUCCESS FACTORS AND CONSTRAINTS

There are no major limitations. The implementation of the system is possible in all productions but the collection of data is based on used and available sensors and data collection systems that are the input for production optimisation.

With InFrame Synapse MES mini, camLine presents a lean, cost-effective, and easy to install solution. This allows SMEs the transparent and process-oriented view onto their production. Production data are processed and available for further process optimization.

The more data can be collected, more optimisations can be performed.

4.7 LESSON LEARNED & SUSTAINABILITY

It is possible to improve every production process and in every production it is possible to produce faster, more efficient and with better quality. Good control and overview of production system is a prerequisite for the future and will be even more important in the future. Described solution will be even improved in the future therefore sustainability is assured.

4.8 REPLICABILITY AND UP SCALING

The application solution can be transferred to all sectors of the manufacturing industry. In the implementation of such complex systems, there are always special requirements that must be fulfilled.

All the positive effects of the implementation can be transferred or repeated, but the approach and the way in which they are carried out due to the different organization of production, age of equipment, employees, management (which may be unprepared for changes), the prepared infrastructure are different. The list of requirements to be fulfilled is individual on a case-by-case basis.

4.9 FINAL REMARKS

The good practice is useful for production oriented SMEs in order to allow them to digitize their production processes and increase their efficiency. In today's worlds, the digitalization is playing an important part, and if SMEs will not jump on this train of so called Industry 4.0, they will face a big gap between the leaders of this new industry era, which will cause them to not be competitive enough.

By implementing solution as this one, they will make the first and concrete steps into digitalization.

Disclaimer / Acknowledgements

No limitations and it can be used for dissemination.

List of attachments:

Attachment1: Youtube video presentation **(**https://youtu.be/8CxCWIx3kLA)

Attachment2; Good practice datasheet (http://inden.si/en/pdf/Datasheet%20InFrame%20Synapse%20MES%20mini%20Release%205.0%20EN%20v03.pdf)

5 GP4: Automatization and digitalization of production and business processes

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Keywords : Production process, Manufacturing software, Cost efficiency, Time tracking, Production stages, Integration
Good practice applied in: (NACE code) : C32.500 - Manufacture of medical and dental instruments and supplies

Medicop and ININ started the collaboration when ININ implemented ERP solution for managing financial and material flows IPSPlus. In the beginning of 2017 they started new project: Optimization and digitalization of production processes. Consulting services for optimized production processes and implementation of IPSPlus manufacture provided by ININ, helped Medicopachiev significant improvements.

5.1 GOOD PRACTICE DESCRIPTION

By implementing new solution, Medicop gained significant improvements on production process, purchasing process and inventory management. The solution helped company gain significant cost efficiency and higher product quality customized and automatized production and other processes. Additionally, the integration with other solution and central ERP visibly increased time efficiency and reduced administration tasks. Innovative nature of this solution is that it provides fully digitalized information and documentation flow across company. Additionally, it provides needed information and instruction directly on work station. Moreover, for each work order and task the system tracks time, which enables company to determine required resources for specific order and forecast delivery date.

Figure 11: Medicop and ININ cooperation

The advantage of the solution is that it is adjusted for the specific of company's production process and that it is integrated with other software solution. Flexibility enables company to keep its competitive advantage, while integration provides fully digitalized documentation and information flow.

Figure 12: Increasing the quality is most important for Medicop

Figure 13: Production of medical vehicles

5.2 OBJECTIVE AND TARGET AUDIENCE

The solution described previously was implemented in Medicop factory situated in Murska Sobota, Slovenia. The solution can be implemented in various manufacturing companies in need for flexible and adjustable software solution and full digitalization of production and other business processes. It is the most suitable for SMEs.

5.3 METHODOLOGICAL APPROACH

Cost efficiency related to the implementation of the good practice.

- Reduced amount of packaging due to optimized material purchasing
- Reduced surface needed for inventory due to more optimized purchasing
- Reduced number of complaints due to traceability of production process and consequently fast and easy problem identification

The methodology for implementing the solution comprised of following steps:

1. Agreed and signed collaboration
2. Blue print including detailed description of current business and production processes
3. Meetings with key employees for determining specifics and designing desired solution
4. Adjusting solution for specifics and establishing integrations with other solution
5. Implementing the solution and teaching employees
6. Maintenance, upgrades, new features and more,

Resources needed for implementation are:

- key employees for each business process to define specifics and desired features and to describe current production process
- other employees that will meet the solution at everyday operations
- timespan is determined after blueprint, when scope of required adjustment is defined, and it also depends of company's commitment
- required infrastructure includes monitors for production, identification key cards, server with Microsoft licences, barcode scanner and barcode printer

the financial aspect of implementing the solution depends on specifics required by the company, number of required integrations and implementation time, production process complexity.

5.4 VALIDATION PROCESS

The validation process was completed by measuring time and costs used before and after implementation.

5.5 RESULTS / IMPACT

The impact was highly positive since company significantly reduced time for administration, decreased number of complaints by 20% and optimized material purchasing that led to lower inventory costs. Additionally, it increased on-time deliveries by determining delivery time.

5.6 SUCCESS FACTORS AND CONSTRAINTS

The main limitation lies in employees, which are not ready for changes and are afraid of new technology. This can significantly increase implementation time. Key employees must be willing to cooperate and contribute to successful implementation.

The solution provides flexibility and adjustability, which ensures keeping competitive advantage that lies in good production process. Additionally, every customer is for us individual project to which we allocate sufficient time and effort. Finally, the solution can be easily integrated with

existing software, which reduces time needed for transferring data and documents and eliminated double entry.

In next stages module for production planning and scheduling based on previously gathered data in existing solution, will be developed and implemented. In that way company will be able to organize sales team better and provide them with accurate information on possible delivery date and production occupancy. Additionally, the company will have information on required resources for specific time period.

5.7 LESSON LEARNED & SUSTAINABILITY

The success of the implementation depends on the capability of overcoming the resistance of workers regarding the new technology and different work process. Additionally, the success highly depends on clearly defined and accurately described business process.

The amount of printed documentation is almost zero, while all information is in the system and provided to workers at their work station. Additionally, all documentation is transferred digitally across company.

5.8 REPLICABILITY AND UP SCALING

The solution can be implemented to all kinds of manufacturing companies, either with series production, make to order production or combination of both. It must be noted that solution is designed for small and medium sized companies. There is possibility of extending the solution widely, especially due to new technologies for remote support and maintenance, which reduces costs. For implementation physical presence at location is required.

5.9 FINAL REMARKS

There is possibility of extending the solution widely, especially due to new technologies for remote support and maintenance, which reduces costs. For implementation physical presence at location is required.

Disclaimer / Acknowledgements

No limitations and it can be used for dissemination.

List of attachments:
NA

6 GP5: Heating under glove for work in extreme environments

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Keywords : Textile, temperature sensors, heated wires, embroidery technology
Good practice applied in: (NACE code) : C13 - Manufacture of textiles

Heating under glove can be used as a simple working glove (cool environment), combined with the additional outer layer (cold environment) or with strong insulated outer layer (extreme cold environment). Into textile are integrated temperature sensors, embroider isolative Braids on upper side and heating places over fingertips and electronic control unit, which can regulate different temperature range. Heating elements are heated wires. These are sewn on textiles using embroidery technology.

6.1 GOOD PRACTICE DESCRIPTION

TITERA bridges the gap between small sized companies and large-scale industry. It explores the everyday needs of people related with the textiles and its use. To every project we bring industry knowledge and of the best technical solution for the first batch production. We work large scale companies to produce innovative content, solutions and demonstrators by means of combining materials and technologies.

A lot of innovative products developed in the research organization are usually not developed to the stage of commercialization. This often happens because of the necessary investments in the development of usable prototype, due to poorly conducted market analysis or because of the necessary knowledge needed for the positioning of the product on the market. There are also usually ill-prepared maintenance protocols, the evaluation by end-users is not designed or the knowledge to commercialize is highly inadequate. TITERA has tight collaboration with their end users, for who it develops the smart wearable products and smart composites.

Novel technology is related to combining the wearable technology with the traditional textile technologies processes.

8. Heating under glove can be used as a simple working glove (cool environment), combined with the additional outer layer (cold environment) or with strong insulated outer layer (extreme cold environment).
9.
10. This is specifically used in extreme environments where temperature is very low, for example cold store or regions where the winter is very harsh, with very low degrees. Production oriented companies faces the difficulties on how to equip workers in order to provide them decent workplace, which is why heating gloves together with heating clothes present perfect solution.
11.
12. Following specifications are known for low temperature heating materials:
    - Voltage range of 1.5 V to 230 V
    - Temperature range of 10°C to 100°C
    - Heat output can be adapted according to the customer's preferences
    - Advantages: rapid surface heating and energy-efficient heating compared with conventional wire heating systems

    Heating textiles can be manufactured with various textile manufacturing technologies.

    Energy supplies two batteries with 7,4 V and power 15 W. Booth gloves can be charged at the same time.
    Glove-electronic is made in two options:
    - With integrated temperature sensors for control and regulation.
    - Option ON/OFF – without integrated temperature sensors.

Figure 14: Heating under glove presentation

Figure 15: Thermal measurements

Existing products for heating elements are mostly integrated into the outer garment. Carbon fibres are replacing embedded heating wires, which are rigid and heavy, break easily, and require more energy. Making use of low voltages for safety, electrically heated clothing comes with a button on the outside which enables the regulation of the heating system. Heating is achieved through the integration of the heating pads based on metal wires weaved into the surface. At the moment such heating kits have to be taken out of the garment item while washing. Our heating elements can be washed.

6.2 OBJECTIVE AND TARGET AUDIENCE

The good practice has been tested in Slovenia (Prekmurje) and Germany (Thüringen). The target customers are all the workers in a cold environment. This is why target group are varying from SMEs and large companies to End customers.

6.3 METHODOLOGICAL APPROACH

Product can positive impact the human health. Workers can work longer while exposed to cold environment. While feeling comfortable in cold environment, the work efficiency will be higher. There are no special implementation rules, as product is ready to use. So it is just a matter of reading the instructions on how to use it. There is a need for appropriate sewing equipment which needs to be implemented into traditional manufacturing facilities.

6.4 VALIDATION PROCESS

Validation in our case can be performed through quality check process in a final step of production. Positive feedback from end users.

6.5 RESULTS / IMPACT

The big advantage for people who work or play outdoors is that heated clothing keeps them warm during breaks in activity, when body temperature can decrease quickly. They will feel comfortable.

6.6 SUCCESS FACTORS AND CONSTRAINTS

Today's technical limitations are related to the lack of appropriate sewing machines needed for placing a metal wires over textile layer. Automatization process is required, but not possible yet. The presented heating glove is the only one that kind of type. It consists of two layers. It can also be washed. The product is developed and ready for market, but there is lack of promotion about "smart" textiles. So there still needs to be some work done in order to present the benefits of such best practices.

6.7 LESSON LEARNED & SUSTAINABILITY

Being innovative on every step is needed in all industrial environments. The cooperation between research, business support organizations and end-users (production companies) is needed in order to develop the product which is ready for the market and acceptable by the market. The market of “smart” textile is being developed rapidly and it is just a matter of time, when each of the production line will be using one or another implication of those kind of materials.

6.8 REPLICABILITY AND UP SCALING

Once the technology can be adopted in serial production of heating gloves, also other protective garment items can be produced by the same technology. Transfer the technology on other type of products is welcome.

Researching, developing, creating and demonstrating innovative solutions in the field of the smart textile and wearable electronics, personal protection equipment, thermoregulation and human thermal comfort will bring more and more possible applications. By spreading the technology on other products for personal protection.

6.9 FINAL REMARKS

The heated gloves play an important role in the tough environments, where the temperature is very low. In order to ensure the healthy environment and workers satisfaction and by that also the production efficiency with added value it is important to implement such smart products, which are already on the market and are changing the everyday of workers.

Disclaimer / Acknowledgements

No limitations and it can be used for dissemination.

List of attachments:
NA

7 GP5: E-VINEYARD – Vineyard management software

Elmitel d.o.o..
Matic Šerc
Orehovci 1a, 9250 Gornja Radgona
Slovenia
Tel. +386 40 811 465
E-mail: info@evineyardapp.com

Keywords : Vineyard management, Internet of Things, Production management, SaaS
Good practice applied in: (NACE code) : A1.2.1 - Growing of grapes

Evineyard helps you with paperwork and crucial decisions – to save time, improve sustainability and performance. Evineyard matches the latest technology and science with the real needs of the winegrowers.

7.1 GOOD PRACTICE DESCRIPTION

Elmitel is software based company, which is employing young engineers who are interested in new technologies and innovations. While working with some new ideas the team started to “play” with sensor technology and their application into real life. After initial testing and development, the idea of Evineyard was born and also other possible applications of software based solution into real life scenarios. The solution is introducing new technology in form of sensor technology, while it is also helping to improve the production processes of companies.

13. There are following features available within the solution:
    - Turn regulative records into value: Fill your work evidences from the tractor, in the vineyard, from any device - phone, tablet or computer
    - Regulate irrigation. Achieve superior quality
    - Avoid disease outbreaks. Spray with confidence
    - Reduce vineyard manager's administration.
    - Integration = power, simplicity and safety.
    - No installation. No training. All yours.

Figure 16: eVineyard in a glance

Built with winegrowers, eVineyard is designed with simplicity of use in mind from the ground up. eVineyard is the only fully integrated, complete vineyard management system, on the market. It combines sensor data with data about your activities and vineyard parameters, to give you punctual decision support about when to spray.

Figure 17: eVineyard real case implementation

7.2 OBJECTIVE AND TARGET AUDIENCE

The solution has been implemented in various regions in the world, starting in Europe and Australia, while last applications were done also in North and South America.

Figure 18: Implementations worldwide

The target customers are vine growers, typically those are the ones who have at least 20 Ha of vineyards. But also smaller ones are the target since solution has two options for implementation. Mainly they are SMEs, while also Large companies are the target. We want to develop smaller systems which would be also attractive to end customers which have smaller vineyards.

7.3 METHODOLOGICAL APPROACH

Cost efficiency is important aspect of the solution, and is applicable due to following reasons:

- irrigation management saves water and by this also money
- Spraying just in time and when needed saves investment
- Save up to 80% of time on administration

All in all saves money related to investment into OPEX which can be used differently or transferred into direct income of the company.

By implementing the solution company is increasing the quality of products and increase the production. The solution is taking away the risk of losing the entire crop due to disease outbreak or climate changes and also the risk of losing any data, since they are always stored on the safe in the cloud.

The good practice can be implemented in two ways:

1. Small scale: Implementation of software solution into daily operation of vine grower. Showcase and training for the customer.
2. Large scale: Implementation of sensors in the vineyard, testing their work, implementation of software solution into daily operation of vine grower and connection with field sensors, showcase and training for the customer

In most cases one person is needed who will work with the software with addition to the computer and Smartphone, which are currently not presenting too much of a burden as this is present in everyday life already. In case of large scale there is also a need for investment into sensors on the field.

7.4 VALIDATION PROCESS

The validation is still an ongoing process as we are validating almost each implementation separately.

The first validation took part with our local wine grower, which has its vineyards next to our offices. With his help we were also developing the solution and its functionalities.

7.5 RESULTS / IMPACT

The impact is very good as all the customers are very satisfied with our solution, as it has saved their crop and by that also their expenses many times.

7.6 SUCCESS FACTORS AND CONSTRAINTS

The limitation is usually connected to the specific limitations of the wine grower, as there are different obstacles when implementing the solution. Either the terrain is difficult and there are difficulties with implementation or on other hand person working with the solution does not have basic skills in computer science.

eVineyard is the only fully integrated, complete vineyard management system, on the market. It combines sensor data with data about your activities and vineyard parameters, to give you punctual decision support about when to spray. By that wine growers get full solution from one supplier, not needing to go to one supplier for software and to other for hardware.

There are some specifics in each of the markets. While we are familiar with environment and limits in Europe, we are lacking this knowledge in other continents like Australia and North-South America. This is why we are often looking for partnership in these new markets in order to get more familiar with specialties there.

7.7 LESSON LEARNED & SUSTAINABILITY

It is important to be opened for new things, as this solution was developed in a process of open thinking and “playing” with sensors. Other thing is that every economic area could be transformed into digital. We were acting as pioneers in the area of Agriculture and want to move forward also to other areas. Since there is an upcoming trend of “smart” applications in Agriculture, we are more than sure that the solution will be sustainable throughout next years. As we are in continuous process of simplification of our solution we are making sure that it will be available and understandable for all the wine growers in the region.

7.8 REPLICABILITY AND UP SCALING

The possibility to extend the good practice is huge, as sensors together with developed software can be implemented in different areas of Agriculture, but on other hand not only Agriculture but also economic areas, such as manufacturing and other.

So far we are focusing only into Agriculture, where we are already developing solution also for vegetable growing.

7.9 FINAL REMARKS

The impact of the good practice is very important, as the solution is directly influencing the production of food, which will be an important aspect in future years.

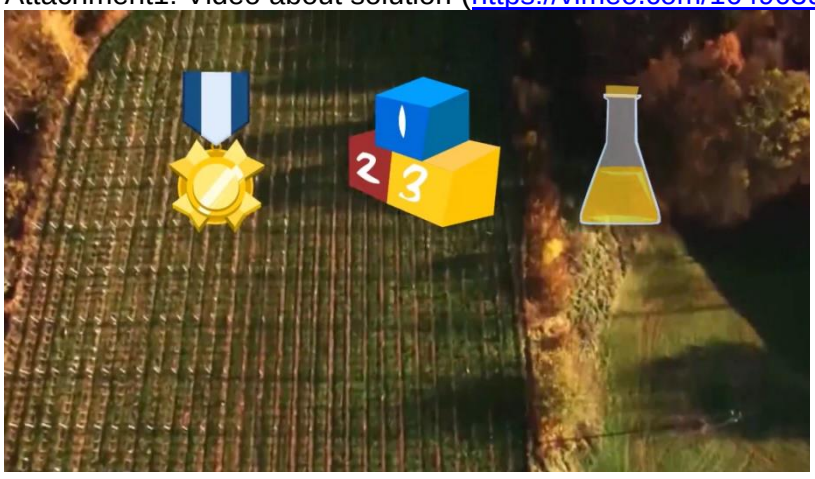
On other hand digitalization is happening in each step of our lives, this is why it is important to implement solutions like ours as this will help the humanity and all the actors included.

Disclaimer / Acknowledgements

No limitations and it can be used for dissemination.

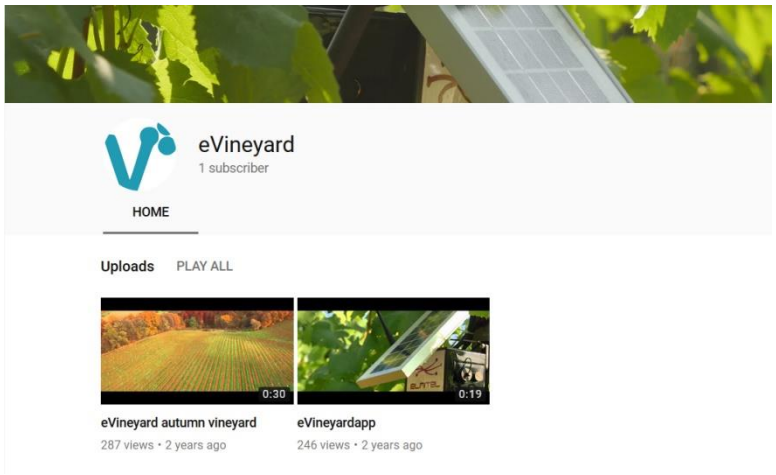
List of attachments:

Attachment1: Video about solution (https://vimeo.com/164903966)



Attachment2: Company website (http://www.elmitel.si/)

Attachment3: eVineyard youtube channel (https://www.youtube.com/channel/UCOEKL8Lea5qTPQUemTLO9fw)



8 LESSONS LEARNED

This section contains the learned lessons related to the good practice collection activity from the perspective of the partner and who provided the data for each good practice.

Lessons learned from the perspective of the companies who provided the good practice information

Overall, the SMEs responding to the questionnaire found the initiative good and added value for them from the perspective of business opportunity and promotion. They were motivated to participate since the information provided will be used in the promotion material.

Furthermore, some SMEs (at the common workshop during the presentation of possible cooperation) explained that they would be willing to participate in several promotions oriented activities, such as conferences, workshops, presentations at events. This information shall be taken into consideration when planning further activities.

On the other hand, the SMEs found it difficult to fill out the questionnaire due to complexity of requested information. This was not considered as a show stopper, however some SMEs needed editorial and explanatory support in filling the information.

Lesson learned from the perspective of the partner

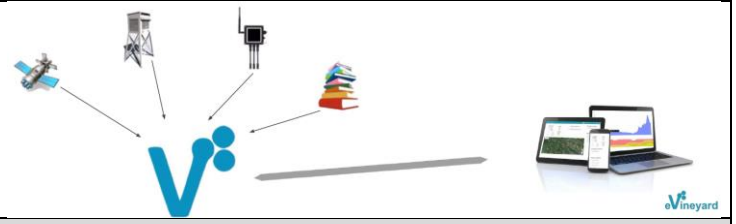
The PTP has been using two approaches in reaching for interested SMEs: (i) direct communication and (ii) social network invitation for cooperation. The invitation sent through the social networks was tested for the first time, resulting in 8 organisations responding and finally with 3 good practices collected. The most of drop-offs were based on the fact that the solution could not be considered as a good practice.

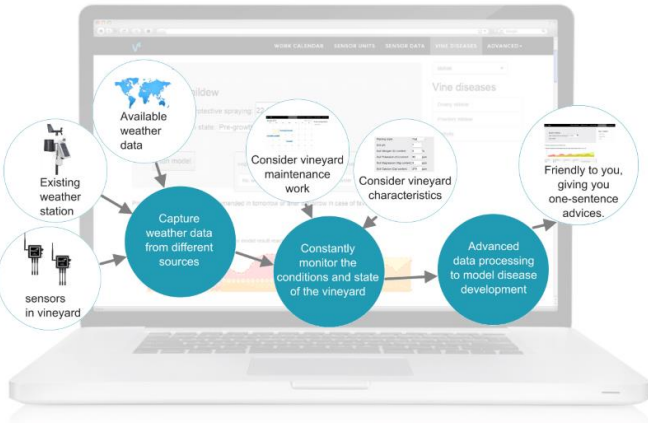
Although we have decided for rather flexible approach in classifying if solution can be considered a good practice, one of the most important lessons learned is that Slovenian companies have rather low perception of the term Smart manufacturing and consequently also recognising what a good practice in the field of Smart manufacturing would be.

The second most important lesson learned is that the Smart manufacturing good practices are difficult to identify, document and present. Most of the solutions for the manufacturing oriented SMEs cannot be purchased and implemented easily (off-the-shelf or plug-and-play solutions), but need initial assessment, careful planning and a lot of customisation. Most of the time, these solutions are rather complex, tackling several fields of implementation at the same time in order to make the solution practical in beneficial.

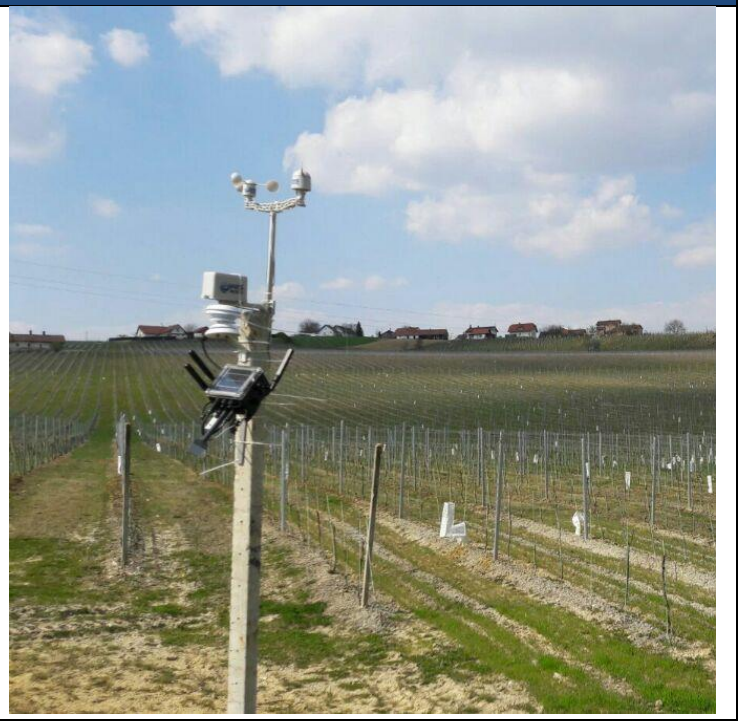
9 TEMPLATE FOR GOOD PRACTICE DOCUMENTATION

Element	Guiding questions	Answers
INTRODUCTION		
Company information	Data identification, logo, contact person, possible representative image(s).	Company: Elmitel d.o.o. Contact person: Matic Šerc – R&D manager Orehovci 1a, 9250 Gornja Radgona Phone: +386 40 811 465 E-mail: info@evineyardapp.com Website: www.evineyardapp.com
Name and brief description.	Name or acronym: what is the name that captures the essence of the good practice	E-VINEYARD – Vineyard management software
	Provide a concise description of the good practice being addressed	Evineyard helps you with paperwork and crucial decisions – to save time, improve sustainability and performance. Evineyard matches the latest technology and science with the real needs of the winegrowers.

Element	Guiding questions	Answers
		
GOOD PRACTICE DESCRIPTION		
Detailed description	How did the SME create good practice / new product?	Elmitel is software based company, which is employing young engineers who are interested in new technologies and innovations. While working with some new ideas the team started to “play” with sensor technology and their application into real life. After initial testing and development, the idea of Evineyard was born and also other possible applications of software based solution into real life scenarios.
	What is the relationship to SFH approach: novel technology, production processes, HRM or cost efficiency, quality assurance, risk management?	The solution is introducing new technology in form of sensor technology, while it is also helping to improve the production processes of companies.
	Describe what are the technical solutions and innovations: of the good practice	There are following features available within the solution: - Turn regulative records into value: Fill your work evidences from the tractor, in the vineyard, from any device - phone, tablet or computer - Regulate irrigation. Achieve superior quality - Avoid disease outbreaks. Spray with confidence - Reduce vineyard manager's administration. - Integration = power, simplicity and safety. - No installation. No training. All yours.

Element	Guiding questions	Answers
		
	Highlights (or keywords) of the Best Practice	Vineyard management, Internet of Things, Production management, SaaS
	Good practice applied in : (NACE code)	A1.2.1 - Growing of grapes
Benchmarking	How does your solution related to others provided by competitors	Built with winegrowers, eVineyard is designed with simplicity of use in mind from the ground up. eVineyard is the only fully integrated, complete vineyard management system, on the market. It combines sensor data with data about your activities and vineyard parameters, to give you punctual decision support about when to spray.
Additional information's / materials	Provide additional information if existing such as case studies, datasheets, whitepapers, awards and other relevant information. Electronic sources (websites, social media, pictures, videos) are encouraged to be included in this	https://vimeo.com/164903966 http://www.elmitel.si/ https://www.youtube.com/channel/UCOEKL8Lea5qTPQUemTLO9fw

Element	Guiding questions	Answers
	section. Training manuals, guidelines, technical fact sheets, posters, pictures, video animations, audio documents, 3D files, and/or other material about the Good practice implementation (if existing).	

Element	Guiding questions	Answers
		
OBJECTIVE AND TARGET AUDIENCE		
Geographical coverage and target audience	What is the geographical range where the good practice has been used / tested / validated: country, region, Danube Region if is relevant and possible	The solution has been implemented in various regions in the world, starting in Europe and Australia, while last applications were done also in North and South America.

Element	Guiding questions	Answers
		
	Specify also the target audience/potential customers and stakeholders (stakeholders can affect or be affected)	The target customers are vine growers, typically those are the ones who have at lease 20 Ha of vineyards. But also smaller ones are the target since solution has two options for implementation.
Targeted customers and scale of use	Select the target group of customers: 1. SMEs (<250 employees) 2. Large companies 3. Public institutions 4. End customer (Business to Customer) Other, please specify	Mainly they are SMEs, while also Large companies are the target. We want to develop smaller systems which would be also attractive to end customers which have smaller vineyards.
METHODOLOGICAL APPROACH		
Managerial aspects	Cost efficiency of the good practice, if applicable	Cost efficiency is important aspect of the solution, and is applicable due to following reasons: - irrigation management saves water and by this also money - Spraying just in time and when needed saves investment

Element	Guiding questions	Answers
		- Save up to 80% of time on administration All in all saves money related to investment into OPEX which can be used differently or transferred into direct income of the company.
	Quality assurance aspects, if applicable	By implementing the solution company is increasing the quality of products and increase the production.
	Risk management aspects, if applicable	The solution is taking away the risk of loosing all the crop due to disease outbreak or climate changes and also the risk of loosing any data, since they are always stored on the safe in the cloud.
Implementation guidelines	How can the Good practice be implemented?	The good practice can be implemented in two ways: 3. Small scale: Implementation of software solution into daily operation of vine grower. Showcase and training for the customer. 4. Large scale: Implementation of sensors in the vineyard, testing their work, implementation of software solution into daily operation of vine grower and connection with field sensors, showcase and training for the customer
	What resources are necessary for implementation (personnel, finance, infrastructure and timespan)?	In most cases one person is needed who will work with the software with addition to the computer and smartphone, which are currently not presenting too much of a burden as this is present in everyday life already. In case of large scale there is also a need for investment into sensors on the field.
VALIDATION PROCESS		
Validation	Provide a brief description of the good practice validation	The validation is still an ongoing process as we are

Element	Guiding questions	Answers
	process.	validating almost each implementation separately. The first validation took part with our local wine grower, which has its vineyards next to our offices. With his help we were also developing the solution and its functionalities.
RESULTS / IMPACT		
Solution impact	What has been the impact (positive or negative) of this good practice on the beneficiaries	The impact is very good as all the customers are very satisfied with our solution, as it has saved their crop and by that also their expenses many times.
SUCCESS FACTORS AND CONSTRAINTS		
Limitations and Strong points	Describe limitations, both from the technical and implementation point of view	The limitation is usually connected to the specific limitations of the wine grower, as there are different obstacles when implementing the solution. Either the terrain is difficult and there are difficulties with implementation or on other hand person working with the solution does not have basic skills in computer science.
	Selling points – list the real or perceived benefit of a good practice that differentiates it from the competing brands and gives its client a logical reason to prefer it over other brands	eVineyard is the only fully integrated, complete vineyard management system, on the market. It combines sensor data with data about your activities and vineyard parameters, to give you punctual decision support about when to spray. By that wine growers get full solution from one

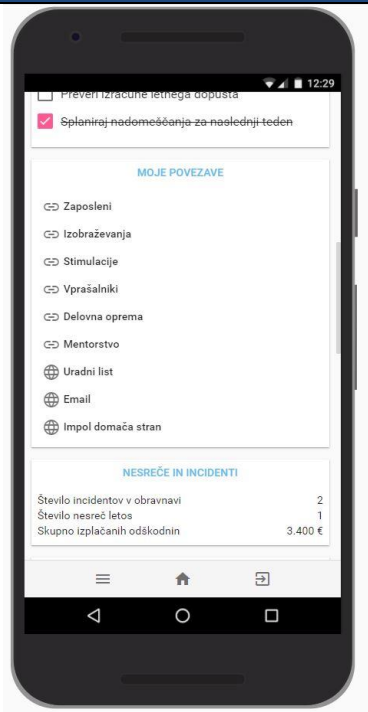
Element	Guiding questions	Answers
		supplier, not needing to go to one supplier for software and to other for hardware.
Need assessment	What else would be needed in order to improve the impact of the Good practice	There are some specifics in each of the markets. While we are familiar with environment and limits in Europe, we are lacking this knowledge in other continents like Australia and North-South America. This is why we are often looking for partnership in these new markets in order to get more familiar with specialties there.
LESSON LEARNED		
Lessons learned	What are the key messages and lessons learned to take away from the good practice experience	It is important to be opened for new things, as this solution was developed in a process of open thinking and "playing" with sensors. Other thing is that every economic area could be transformed into digital. We were acting as pioneers in the area of Agriculture and want to move forward also to other areas.
SUSTAINABILITY		
Sustainability of Good Practice	Describe aspects related to sustainability of the Good Practice, if applicable	Since there is an upcoming trend of "smart" applications in Agriculture, we are more than sure that the solution will be sustainable throughout next years. As we are in continuous process of simplification of our solution we are making sure that it will be available and understandable for all the wine growers in the region.

Element	Guiding questions	Answers
REPLICABILITY AND UP SCALING		
Replicability and further application	How can the solution / good practice be useful for other SMEs?	NA
	What are the possibilities of extending the good practice more widely?	The possibility to extend the good practice is huge, as sensors together with developed software can be implemented in different areas of Agriculture, but on other hand not only Agriculture but also economic areas, such as manufacturing and other. So far we are focusing only into Agriculture, where we are already developing solution also for vegetable growing.
FINAL REMARKS		
Conclusion	Conclude specifying / explaining the impact and usefulness of the good practice.	The impact of the good practice is very important, as the solution is directly influencing the production of food, which will be an important aspect in future years. On other hand digitalization is happening in each step of our lives, this is why it is important to implement solutions like ours as this will help the humanity and all the actors included.
Disclaimer / Acknowledgements	Address any legal loose ends or limitations for dissemination, certify the use of this information for dissemination, online and printed (Yes/No)	No limitations for dissemination.

10 TEMPLATE FOR GOOD PRACTICE DOCUMENTATION

Element	Guiding questions	Answers
INTRODUCTION		
Company information	Data identification, logo, contact person, possible representative image(s).	 4. 5. 6. Skupina Impol 7. Edvard Slaček, CEO 8. Partizanska 38, 2310 Slovenska Bistrica, Slovenija 9. Tel. +386 2 8453 100 E-mail: info@impol.si
Name and brief description.	Name or acronym: what is the name that captures the essence of the good practice	Digitalisation of HRM in IMPOL GROUP
	Provide a concise description of the good practice being addressed	In line with the guidelines of Industry 4.0, the transition to business brings a number of challenges also in the field of human resources management, where the increasing needs for knowledge management, competence development and the management of the complexity of changes are emerging. For this purpose, the human resources development field also needs agile solutions that effectively support strategic management functions with human resources.
GOOD PRACTICE DESCRIPTION		
Detailed description	How did the SME create good practice / new product?	The Impol Group decided to develop the personnel information system, following the following goals: to ensure the corporate management of a complex business group, to follow the requirements of the

Element	Guiding questions	Answers
		corporate strategy of Industry 4.0 and to provide strategic management of employees.
	What is the relationship to SFH approach: novel technology, production processes, HRM or cost efficiency, quality assurance, risk management?	HRM system digitalisation and adaptation for requirements of Industry 4.0
	Describe what are the technical solutions and innovations: of the good practice	With the help of the new information system HRM 4.0, the Impol Group has the appropriate platform for managing the complexity of human resource management. The new information system enables the development of personnel through targeted management, monitoring of activities, competence development, knowledge management, performance measurement (360-degree appraisal), monitoring of company dynamics (measurement of organizational climate, questionnaires, forums), promotion of innovation reporting of useful proposals, innovations), mastering the field of occupational safety (records, medical examinations, work accidents, incidents) and giving feedback. The IT solution also enables every employee access to the application with the help of a smartphone, thus promoting personal development, two-way communication, building affiliation and simplifying data management.
	Highlights (or keywords) of the Best Practice	HRM digitalisation, Industry 4.0
	Good practice applied in : (NACE code)	J63 - Information service activities; J62 - Computer programming, consultancy and related activities
Benchmarking	How does your solution related to others provided by competitors	The solution was developed for dedicated requirements in IMPOL group and therefore it is not possible to directly compare the solution with competitors.

Element	Guiding questions	Answers
Additional information's / materials	Provide additional information if existing such as case studies, datasheets, whitepapers, awards and other relevant information. Electronic sources (websites, social media, pictures, videos) are encouraged to be included in this section. Training manuals, guidelines, technical fact sheets, posters, pictures, video animations, audio documents, 3D files, and/or other material about the Good practice implementation (if existing).	

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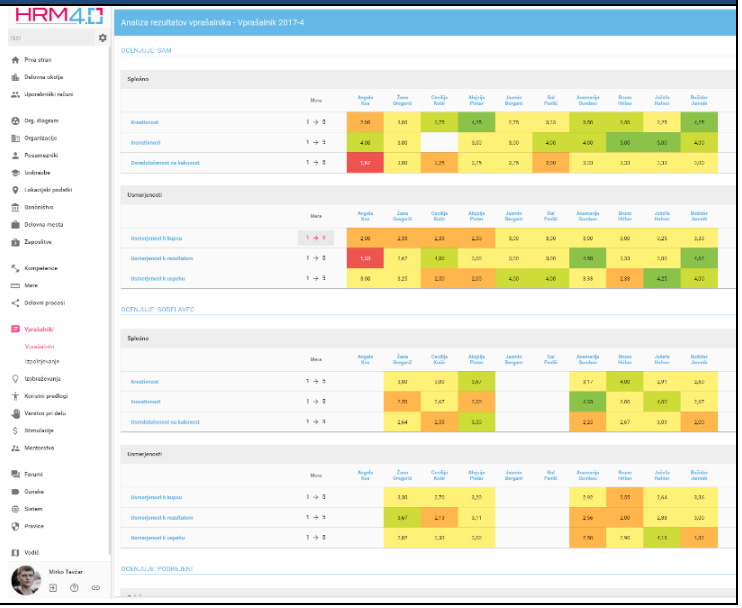
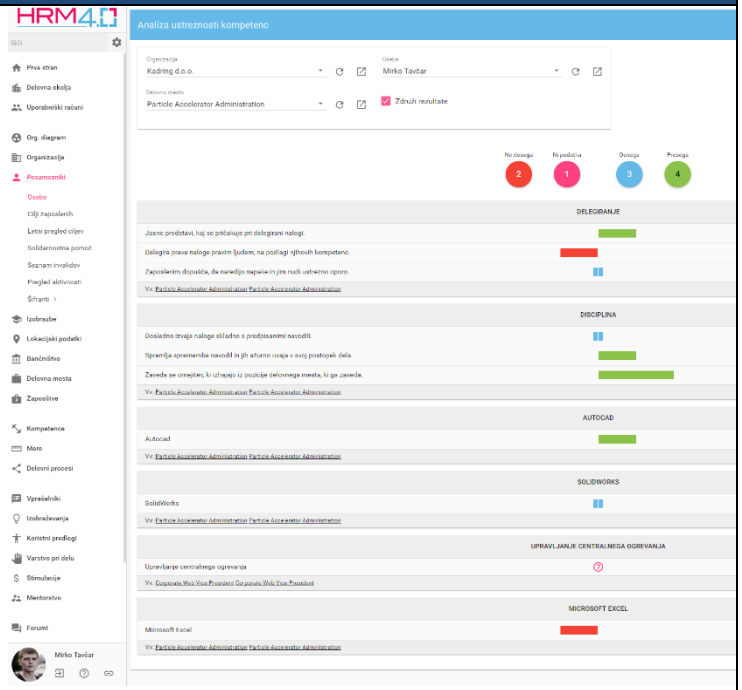
		

Element	Guiding questions	Answers
		
OBJECTIVE AND TARGET AUDIENCE		
Geographical coverage and target audience	What is the geographical range where the good practice has been used / tested / validated: country, region, Danube Region if is relevant and possible	Slovenija, EU
	Specify also the target audience/potential customers and stakeholders (stakeholders can affect or be affected)	Advanced analytics enables the up-to-date monitoring of key personnel development indicators while at the same time the system through its interconnectivity with key institutions (Employment Service, Health Insurance Institute) greatly simplifies administrative

Element	Guiding questions	Answers
		processes and reporting processes.
Targeted customers and scale of use	Select the target group of customers: **5. SMEs (<250 employees)** **6. Large companies** **7. Public institutions** 8. End customer (Business to Customer) Other, please specify	
METHODOLOGICAL APPROACH		
Managerial aspects	Cost efficiency of the good practice, if applicable	The solution is software based and as such very cost effective.
	Quality assurance aspects, if applicable	The solution is providing data that can be incorporated to existing quality assurance systems.
	Risk management aspects, if applicable	The solution is providing data that can be incorporated to existing risk management systems.
Implementation guidelines	How can the Good practice be implemented?	To implement the solution in a company it is required to outline the functionalities to be used. The implementation itself is technically not very challenging but focus to internal training of personnel using the system in organisation is important.
	What resources are necessary for implementation (personnel, finance, infrastructure and timespan)?	Implementation of IT solution does not require much resources.
VALIDATION PROCESS		
Validation	Provide a brief description of the good practice validation process.	The validation was done by HRM responsible persons in IMPOL GROUP. The process was performed while development of the product and several people have been involved.

Element	Guiding questions	Answers
RESULTS / IMPACT		
Solution impact	What has been the impact (positive or negative) of this good practice on the beneficiaries	The application itself will bring the following benefits: - saving time for data processing, - saving time for data entry, - reduction in the number of transmission errors, - increasing transparency of data, - improved control of events in organizations. Career management tools will enable employees to: - raising the commitment of employees, - raising the membership of employees, - raising the productivity of employees, - reduction of work incidents. HRM 4.0 offers the following benefits as a smart service: - Improves the state of knowledge and the possibility of more efficient and successful management of employees and their rewards, motivation etc..., - supports the lean business of organizations, since it makes it easier to manage data and knowledge of employees, - Provides added value for users with reminders, predictions and skills for future planning.
SUCCESS FACTORS AND CONSTRAINTS		
Limitations and Strong points	Describe limitations, both from the technical and implementation point of view	No major limitations identified.
	Selling points – list the real or perceived benefit of a good practice that differentiates it from the competing brands and	Larger companies are aware of HRM processes and are searching for IT supported systems to automate

Element	Guiding questions	Answers
	gives its client a logical reason to prefer it over other brands	data collection from employees related to satisfaction on working place, productiveness, education, trainings and other HRM related relevant data.
Need assessment	What else would be needed in order to improve the impact of the Good practice	NA
LESSON LEARNED		
Lessons learned	What are the key messages and lessons learned to take away from the good practice experience	With the development of the HRM 4.0 application, the following knowledge was acquired at three levels: a) Implementation level: Process knowledge, how to approach application development, b) content level: The application comprehensively lists the basic processes in the personnel function, with emphasis on the specifics required by the manufacturing companies, c) Structural level: The application provides a framework within which organizations can store their knowledge.
SUSTAINABILITY		
Sustainability of Good Practice	Describe aspects related to sustainability of the Good Practice, if applicable	The solution is software based and all relevant data are stored in databases. The data is collected regularly and the database will grow with time. Sustainability as such is given by the use of relevant data collected.
REPLICABILITY AND UP SCALING		
Replicability and further application	How can the solution / good practice be useful for other SMEs?	The process openness of the application also enables the use in other organizations, and therefore a marketing application distribution strategy was

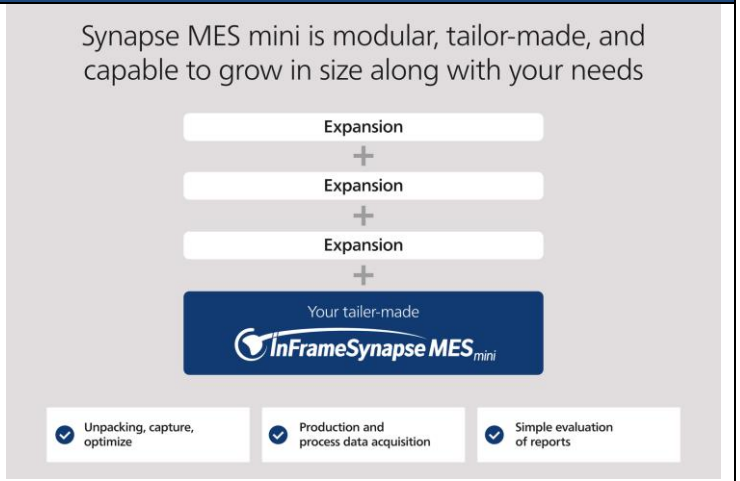
Element	Guiding questions	Answers
		created, which will cover the costs of development and will provide the basis for further upgrading of the functionality. In this context, we can, for example, with the application; they helped primarily small and medium-sized enterprises in the management of human resources, based on the use of smart solutions.
	What are the possibilities of extending the good practice more widely?	The solution can be further integrated to other existing systems in the company to provide more insights and better information's for taking HRM related decisions that can influence the total productivity in the company.
FINAL REMARKS		
Conclusion	Conclude specifying / explaining the impact and usefulness of the good practice.	The solution described can only support the company strategy if integrated properly to existing HRM and management decision processes. The solution cannot be a substitute for required professionals that will take decisions but can support them to collect relevant information faster and take decisions based on such information in a more exact way.
Disclaimer / Acknowledgements	Address any legal loose ends or limitations for dissemination, certify the use of this information for dissemination, online and printed (Yes/No)	

11 TEMPLATE FOR GOOD PRACTICE DOCUMENTATION

Element	Guiding questions	Answers
INTRODUCTION		
Company information	Data identification, logo, contact person, possible representative image(s).	0. INDEN D.O.O. 1. Cesta v Mestni log 88a, 2. 1000 Ljubljana, Slovenija 3. T: +386 31 556 721 W: www.inden.si 4. Klemen Lisec KAM, klemen.lisec@inden.si Dušan Božič DIREKTOR, dusan.bozic@inden.si
Name and brief description.	Name or acronym: what is the name that captures the essence of the good practice	InFrame Synapse MES: Effective entry into IT-based manufacturing
	Provide a concise description of the good practice being addressed	Digitization and computerization of business processes through the implementation of dedicated information systems and automated data acquisition and processes is today key to maintaining and increasing competitiveness. The project gave the experience of the 4th industrial revolution of first hand and a tangible experience of how digitalization has a direct impact on production.
GOOD PRACTICE DESCRIPTION		
Detailed description	How did the SME create good practice / new product?	Own development together with partner companies. In the first step functional specification of software solution based on client's expectations, requests and analysis of the situation is written. Functional specification includes listing all functionalities and

Element	Guiding questions	Answers
		defining data model of the new software solution. We offer support of our experts' wide range of knowledge and experience in fields of business, industry and energetics when designing content of the solution. In the second step code planning and development is executed. We use modern and up-to-date business application software architecture and Microsoft (.NET and MS SQL) environment. Outcome of code development is web-based application that can be hosted in the cloud which guarantees high level of reliability and data security or hosting can be set up on client's server. In the last step of information systems' development cycle, software implementation at the customer is done. To ease the transition to new information system, educational workshops are organised. While the system is up and running clients are provided constant maintenance and application support. Succesfully finished project follows phase of maintenance and possible upgrades where we offer content and technical assistance.
	What is the relationship to SFH approach: novel technology, production processes, HRM or cost efficiency, quality assurance, risk management?	Production process control system.
	Describe what are the technical solutions and innovations: of the good practice	Complete data collection at a surprisingly low price. The solution is modular, scalable, and tailored. It scales with needs of production. The InFrame

Element	Guiding questions	Answers
		Synapse MES mini can grow with customer requirements. It can be scaled to a mature InFrame Synapse MES if needed. As an easily embedded solution for Tracking and Tracing needs, the InFrame Synapse MES mini certainly is a worthwhile investment.
	Highlights (or keywords) of the Best Practice	• Unbox, collect data, and optimize • Production and process data acquisition, direct entry in tracking & tracing • Simple analysis via reporting • Simple add further equipment and work plans • Modular functional concept – simple add further functions • Cost-effective solution, rapid integration • Create your own reports
	Good practice applied in : (NACE code)	J63 - Information service activities

Element	Guiding questions	Answers
Benchmarking	How does your solution related to others provided by competitors	 The solution is better than competition because it developed in the giant semiconductor industry, the white goods industry and the automotive industry, which had clear demands and a vision for the future. These are today completely digital factories and part of their solution is also our solution. The solution is designed to be updated every 14 days - as a result, the solution always complies with the latest guidelines.
Additional information's / materials	Provide additional information if existing such as case studies, datasheets, whitepapers, awards and other relevant information. Electronic sources (websites, social media, pictures, videos) are encouraged to be included in this section. Training manuals, guidelines, technical fact sheets, posters, pictures, video animations, audio documents, 3D	https://youtu.be/8CxCWIx3kLA http://inden.si/en/pdf/Datasheet%20InFrame%20Synapse%20MES%20mini%20Release%205.0%20EN%20v03.pdf

Element	Guiding questions	Answers
	files, and/or other material about the Good practice implementation (if existing).	
OBJECTIVE AND TARGET AUDIENCE		
Geographical coverage and target audience	What is the geographical range where the good practice has been used / tested / validated: country, region, Danube Region if is relevant and possible	Slovenia (EU)
	Specify also the target audience/potential customers and stakeholders (stakeholders can affect or be affected)	The target group of good practice are all companies that have discrete production in their establishments. The size of companies that are suitable for the implementation of good practice or solution starts with 30 to 50 employees in production.
Targeted customers and scale of use	Select the target group of customers: **9. SMEs (<250 employees)** 10. Large companies 11. Public institutions 12. End customer (Business to Customer) Other, please specify	Target group are mainly SMEs.
METHODOLOGICAL APPROACH		
Managerial aspects	Cost efficiency of the good practice, if applicable	Small and medium-sized manufacturers benefit from a production, which is consistently IT-based to be controllable and schedulable. In the past, the introduction and maintenance of such Manufacturing Execution Systems (MES) have been associated with great effort. With InFrame Synapse MES mini, the SMEs can get the transparent and process-oriented view onto their production. Production data are

Element	Guiding questions	Answers
		processed and available for further process optimization.
	Quality assurance aspects, if applicable	Better overview of production process and available data are supporting existing quality management systems and quality assurance by providing relevant information for further decisions and actions.
	Risk management aspects, if applicable	Better overview of production process and available data are reducing the potential risk and in general supporting the risk management process.
Implementation guidelines	How can the Good practice be implemented?	If a business considers data collection and analysis to be most important, a mature high-volume MES would be too complex and expensive. InFrame had these thoughts in mind and came out with InFrame Synapse MES mini which is a “stripped down” MES for SMEs and their entry into the IT-based process optimization. This version is simply a Manufacturing Execution System without the “Execution”. Nevertheless, the InFrame Synapse MES mini offers complete production and process data collection, plus a cost-effective entry into productive tracking and tracing.
	What resources are necessary for implementation (personnel, finance, infrastructure and timespan)?	The implementation requires a person from customer who is capable of describing all production process and is actively involved in scaling up the solution. The whole process is usually done within a month, while the finances are not of a big scale as we are usually

Element	Guiding questions	Answers
		preparing the solution for specific customer needs, so also the finances are being discussed with customers from case to case.
VALIDATION PROCESS		
Validation	Provide a brief description of the good practice validation process.	Validation of implemented solution is done by existing team in the company that was responsible for production already before implementation. More sophisticated information and details provided are critically evaluated and validated to get an approval from customer top management.
RESULTS / IMPACT		
Solution impact	What has been the impact (positive or negative) of this good practice on the beneficiaries	Through control and greater transparency of production, bottlenecks, deviations from the predicted quality levels (through monitoring of parameters) can be identified, error types and analysis are monitored, real-time alarms are sent to the responsible person on smart devices (also the possibility of analyzing alarms, frequency ranges, depending on a particular machine or operator, etc.), through various industrial indicators (most often, indicators such as the total efficiency of devices or OEE for monitoring the performance of devices are exposed). It is possible to obtain an additional dimension of production, to control material consumption and consequent reduction in waste, which helps to reduce costs directly. It is also possible to control the operators in production. Added value is

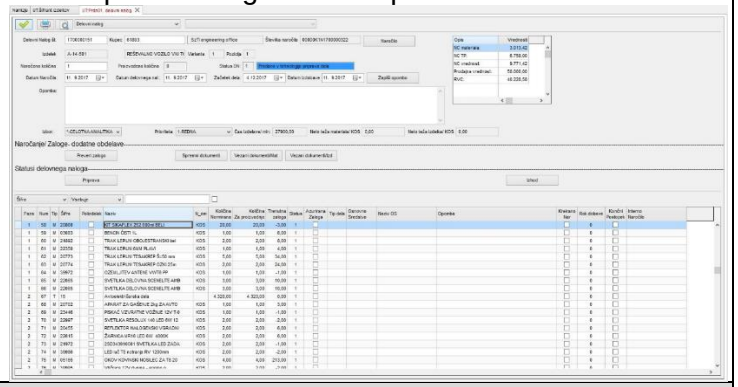
Element	Guiding questions	Answers
		flexibility, control and visualization of events in production.
SUCCESS FACTORS AND CONSTRAINTS		
Limitations and Strong points	Describe limitations, both from the technical and implementation point of view	There are no major limitations. The implementation of the system is possible in all productions but the collection of data is based on used and available sensors and data collection systems that are the input for production optimisation.
	Selling points – list the real or perceived benefit of a good practice that differentiates it from the competing brands and gives its client a logical reason to prefer it over other brands	With InFrame Synapse MES mini, camLine presents a lean, cost-effective, and easy to install solution. This allows SMEs the transparent and process-oriented view onto their production. Production data are processed and available for further process optimization.
Need assessment	What else would be needed in order to improve the impact of the Good practice	The more data can be collected, more optimisations can be performed.
LESSON LEARNED		
Lessons learned	What are the key messages and lessons learned to take away from the good practice experience	It is possible to improve every production process and in every production it is possible to produce faster, more efficient and with better quality.
SUSTAINABILITY		
Sustainability of Good Practice	Describe aspects related to sustainability of the Good Practice, if applicable	Good control and overview of production system is a prerequisite for the future and will be even more important in the future. Described solution will be even improved in the future therefore sustainability is assured.

Element	Guiding questions	Answers
REPLICABILITY AND UP SCALING		
Replicability and further application	How can the solution / good practice be useful for other SMEs?	The application solution can be transferred to all sectors of the manufacturing industry. In the implementation of such complex systems, there are always special requirements that must be fulfilled.
	What are the possibilities of extending the good practice more widely?	All the positive effects of the implementation can be transferred or repeated, but the approach and the way in which they are carried out due to the different organization of production, age of equipment, employees, management (which may be unprepared for changes), the prepared infrastructure are different. The list of requirements to be fulfilled is individual on a case-by-case basis.
FINAL REMARKS		
Conclusion	Conclude specifying / explaining the impact and usefulness of the good practice.	The good practice is useful for production oriented SMEs in order to allow them to digitize their production processes and increase their efficiency. In todays worlds, the digitalization is playing an important part, and if SMEs will not jump on this train of so called Industry 4.0, they will face a big gap between the leaders of this new industry era, which will cause them to not be competitive enough. By implementing solution as this one, they will make the first and concrete steps into digitalization.
Disclaimer /	Address any legal loose ends or limitations for dissemination,	No limitations.

Element	Guiding questions	Answers
Acknowledgements	certify the use of this information for dissemination, online and printed (Yes/No)	

12 TEMPLATE FOR GOOD PRACTICE DOCUMENTATION

Element	Guiding questions	Answers
INTRODUCTION		
Company information	Data identification, logo, contact person, possible representative image(s).	Company: ININ d.o.o.  Logo: Contact person: Tara Rožman, Marketing Manager Phone: +386 2 534 14 10 E-mail: tara.rozman@inin.si Company: Medicop d.o.o. Logo:  Contact person: Tadej Ružič, director Phone: +386 2 539 12 50 E-mail: tadej.ruzic@medicop.eu
Name and brief description.	Name or acronym: what is the name that captures the essence of the good practice	Automatization and digitalization of production and business processes
	Provide a concise description of the good practice being addressed	Medicop and ININ started the collaboration when ININ implemented ERP solution for managing financial and material flows IPSPlus. In the beginning of 2017 they started new project: Optimization and digitalization of production processes. Consulting services for optimized production processes and implementation of IPSPlus manufacture, provided by ININ, helped

Element	Guiding questions	Answers
		Medicop achiev significant improvements. 
GOOD PRACTICE DESCRIPTION		
Detailed description	How did the SME create good practice / new product?	By implementing new solution, Medicop gained significant improvements on production process, purchasing process and inventory management.
	What is the relationship to SFH approach: novel technology, production processes, HRM or cost efficiency, quality assurance, risk management?	The solution helped company gain significant cost efficiency and higher product quality customized and automatized production and other processes. Additionally, the integration with other solution and central ERP visibly increased time efficiency and reduced administration tasks.
	Describe what are the technical solutions and innovations: of the good practice	Innovative nature of this solution is that it provides fully digitalized information and documentation flow across company. Additionally, it provides needed information and instruction directly on work station. Moreover, for each work order and task the system tracks time, which enables company to determine required resources for specific order and forecast delivery date.

Element	Guiding questions	Answers
		
	Highlights (or keywords) of the Best Practice	Production process, Manufacturing software, Cost efficiency, Time tracking, Production stages, Integration
	Good practice applied in : (NACE code)	C32.500 - Manufacture of medical and dental instruments and supplies
Benchmarking	How does your solution related to others provided by competitors	The advantage of the solution is that it is adjusted for the specific of company's production process and that it is integrated with other software solution. Flexibility enables company to keep its competitive advantage, while integration provides fully digitalized documentation and information flow.
Additional information's / materials	Provide additional information if existing such as case studies, datasheets, whitepapers, awards and other relevant information. Electronic sources (websites, social media, pictures, videos) are encouraged to be included in this section. Training manuals, guidelines, technical fact sheets, posters, pictures, video animations, audio documents, 3D files, and/or other material about the Good practice implementation (if existing).	

Element	Guiding questions	Answers
		
		

Element	Guiding questions	Answers
OBJECTIVE AND TARGET AUDIENCE		
Geographical coverage and target audience	What is the geographical range where the good practice has been used / tested / validated: country, region, Danube Region if is relevant and possible	The solution described previously was implemented in Medicop factory situated in Murska Sobota, Slovenia.
	Specify also the target audience/potential customers and stakeholders (stakeholders can affect or be affected)	The solution can be implemented in various manufacturing companies in need for flexible and adjustable software solution and full digitalization of production and other business processes.
Targeted customers and scale of use	Select the target group of customers: 13. SMEs (<250 employees) 14. Large companies 15. Public institutions 16. End customer (Business to Customer) Other, please specify	SMEs (<250 employees)
METHODOLOGICAL APPROACH		
Managerial aspects	Cost efficiency of the good practice, if applicable	- Reduced amount of packaging due to optimized material purchasing - Reduced surface needed for inventory due to more optimized purchasing
	Quality assurance aspects, if applicable	- Reduced number of complaints due to traceability of production process and consequently fast and easy problem identification
	Risk management aspects, if applicable	N/A
Implementation guidelines	How can the Good practice be implemented?	The methodology for implementing the solution comprised of following steps: 7. Agreed and signed collaboration 8. Blue print including detailed description of current business and production processes

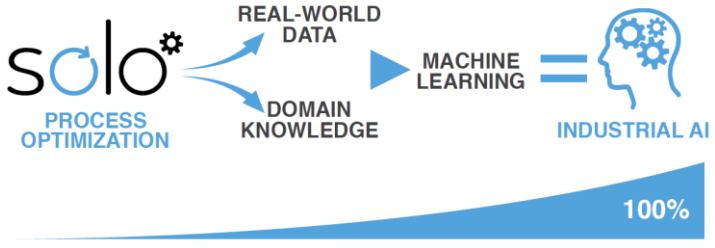
Element	Guiding questions	Answers
		9. Meetings with key employees for determining specifics and designing desired solution 10. Adjusting solution for specifics and establishing integrations with other solution 11. Implementing the solution and teaching employees 12. Maintenance, upgrades, new features and more…
	What resources are necessary for implementation (personnel, finance, infrastructure and timespan)?	Resources needed for implementation are: - key employees for each business process to define specifics and desired features and to describe current production process - other employees that will meet the solution at everyday operations - timespan is determined after blueprint, when scope of required adjustment is defined, and it also depends of company's commitment - required infrastructure includes monitors for production, identification key cards, server with Microsoft licences, barcode scanner and barcode printer - the financial aspect of implementing the solution depends on specifics required by the company, number of required integrations and implementation time, production process complexity
VALIDATION PROCESS		
Validation	Provide a brief description of the good practice validation process.	The validation process was completed by measuring time and costs used before and after implementation.
RESULTS / IMPACT		
Solution impact	What has been the impact (positive or negative) of this good	The impact was highly positive since company

Element	Guiding questions	Answers
	practice on the beneficiaries	significantly reduced time for administration, decreased number of complaints by 20% and optimized material purchasing that led to lower inventory costs. Additionally, it increased on-time deliveries by determining delivery time.
SUCCESS FACTORS AND CONSTRAINTS		
Limitations and Strong points	Describe limitations, both from the technical and implementation point of view	The main limitation lies in employees, which are not ready for changes and are afraid of new technology. This can significantly increase implementation time. Key employees must be willing to cooperate and contribute to successful implementation.
	Selling points – list the real or perceived benefit of a good practice that differentiates it from the competing brands and gives its client a logical reason to prefer it over other brands	The solution provides flexibility and adjustability, which ensures keeping competitive advantage that lies in good production process. Additionally, every customer is for us individual project to which we allocate sufficient time and effort. Finally, the solution can be easily integrated with existing software, which reduces time needed for transferring data and documents and eliminated double entry.
Need assessment	What else would be needed in order to improve the impact of the Good practice	In next stages module for production planning and scheduling based on previously gathered data in existing solution, will be developed and implemented. In that way company will be able to organize sales team better and provide them with accurate information on possible delivery date and production occupancy. Additionally, the company will have

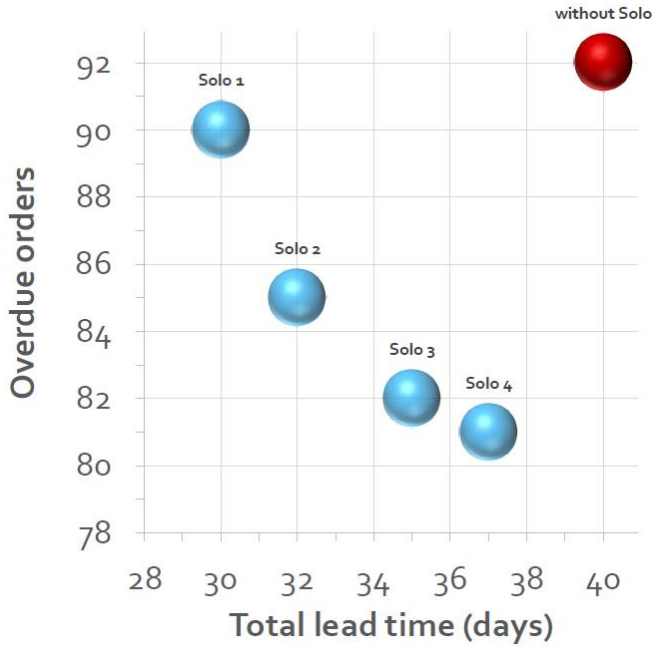
Element	Guiding questions	Answers
		information on required resources for specific time period.
LESSON LEARNED		
Lessons learned	What are the key messages and lessons learned to take away from the good practice experience	The success of the implementation depends on the capability of overcoming the resistance of workers regarding the new technology and different work process. Additionally, the success highly depends on clearly defined and accurately described business process.
SUSTAINABILITY		
Sustainability of Good Practice	Describe aspects related to sustainability of the Good Practice, if applicable	The amount of printed documentation is almost zero, while all information is in the system and provided to workers at their work station. Additionally, all documentation is transferred digitally across company.
REPLICABILITY AND UP SCALING		
Replicability and further application	How can the solution / good practice be useful for other SMEs?	The solution can be implemented to all kinds of manufacturing companies, either with series production, make to order production or combination of both. It must be noted that solution is designed for small and medium sized companies.
	What are the possibilities of extending the good practice more widely?	There is possibility of extending the solution widely, especially due to new technologies for remote support and maintenance, which reduces costs. For implementation physical presence at location is required.
FINAL REMARKS		

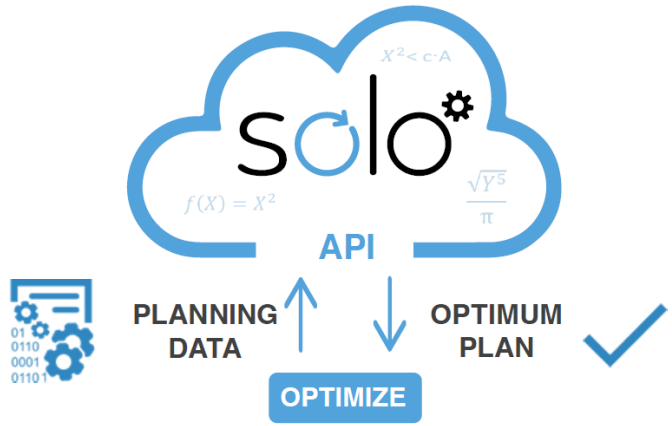
Element	Guiding questions	Answers
Conclusion	Conclude specifying / explaining the impact and usefulness of the good practice.	The solution requires some financial investment; however it provides solution integrated with other software used by company and features adjusted for specifics of production process. All that provides company with significant time and cost savings.
Disclaimer / Acknowledgements	Address any legal loose ends or limitations for dissemination, certify the use of this information for dissemination, online and printed (Yes/No)	

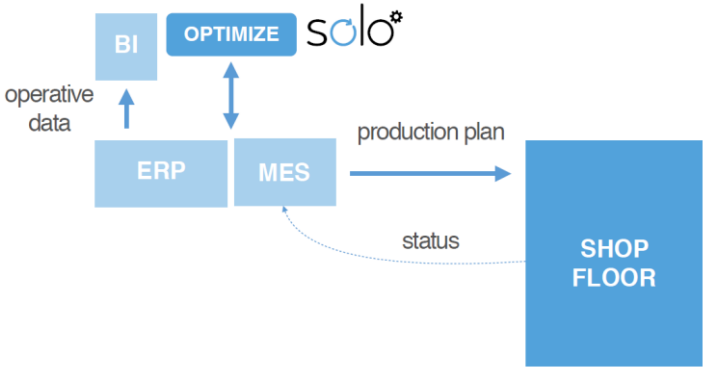
13 TEMPLATE FOR GOOD PRACTICE DOCUMENTATION

Element	Guiding questions	Answers
INTRODUCTION		
Company information	Data identification, logo, contact person, possible representative image(s).	Data identification : Solopex d.o.o. Logo: Contact person: Alexander Engels – Managing director Pionirska cesta 9, 1360 Vrhnika, Slovenia Phone: +386 (0) 30 646 455 E-mail: info@solopex.com Website: www.solopex.com
Name and brief description.	Name or acronym: what is the name that captures the essence of the good practice	Solopex solo – personalized industrial intelligence tool
	Provide a concise description of the good practice being addressed	IoT solution for production company operating in high-dynamic supply chain (automotive industry or similar high-demanding and fast-paced industry). It is especially applicable for those from steel, plastic and tooling industry. 

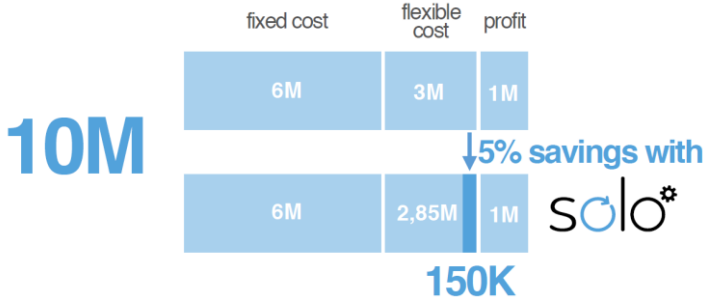
Element	Guiding questions	Answers
GOOD PRACTICE DESCRIPTION		
Detailed description	How did the SME create good practice / new product?	The founders of the Solopex have ideal set of skills to create this product and ensure success in the market. The team have following members: - Industrial IT Specialist (Manufacturing, telecommunications,…) - Optimization Expert (Statistics, engineering,…) - Serial Entrepreneur (30 years of experience in tooling and founder of 9 companies)
	What is the relationship to SFH approach: novel technology, production processes, HRM or cost efficiency, quality assurance, risk management?	The solution is tied to increasing the efficiency of production processes.
	Describe what are the technical solutions and innovations: of the good practice	SOLO is the ultimate tuning add-on for industrial IT systems. It enables manufacturers to take the best planning decisions for organizing complex tasks on and off the shop floor. SOLO plans tasks like material preparation, production scheduling, workforce allocation, and warehousing optimally at the push of a button. SOLO combines the power of the cloud with a high-end decision optimization engine. SOLO is accessible as a SaaS product via REST API, integrating easily with any system infrastructure. It does not disrupt existing processes and adjusts to the current data situation.

Element	Guiding questions	Answers
		
	Highlights (or keywords) of the Best Practice	Specific keywords: Industrial AI, IoT solution, Supply chain
	Good practice applied in : (NACE code)	C22 - Manufacture of rubber and plastic products; C24 - Manufacture of basic metals; C25 - Manufacture of fabricated metal products, except machinery and equipment
Benchmarking	How does your solution related to others provided by competitors	Our solution is already taking into consideration next step of Industrial revolution (Industrial AI). It is also noted that our solution can be ready in less than a

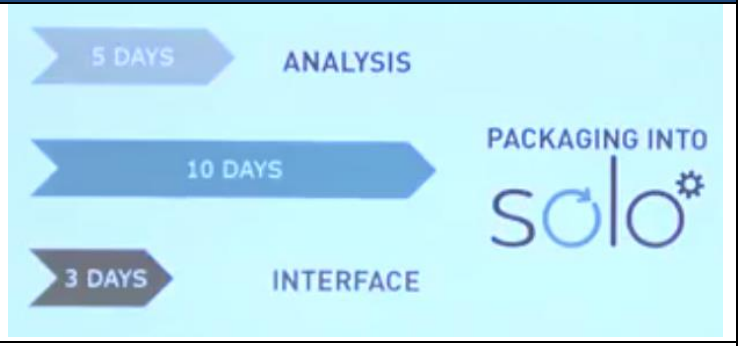
Element	Guiding questions	Answers
		month, while it is not disrupting the manufacturing process. Another plus is also subscription based fee, which is not presenting too high investment related issue for the company.
Additional information's / materials	Provide additional information if existing such as case studies, datasheets, whitepapers, awards and other relevant information. Electronic sources (websites, social media, pictures, videos) are encouraged to be included in this section. Training manuals, guidelines, technical fact sheets, posters, pictures, video animations, audio documents, 3D files, and/or other material about the Good practice implementation (if existing).	

Element	Guiding questions	Answers
		 **Results depend on Priorities** Old solution / Solo 1 / Solo 2 / Solo 3 / Solo 4 Priority: ? / Minimize total lead time / Prioritize lead time reduction / Prioritize overdue reduction / Minimize overdues Lead time in days: T+40 / T+30 / T+32 / T+35 / T+37 Overdue orders: 92 / 90 / 85 / 82 / 81 Computation time: ~15 min / ~1 min / ~1 min / ~1 min / ~1 min
OBJECTIVE AND TARGET AUDIENCE		
Geographical coverage and target audience	What is the geographical range where the good practice has been used / tested / validated: country, region, Danube Region if is relevant and possible	The good practice is in early phase of adoption, where it was first tested with 4 pilot cases in Slovenia and Croatia. The further implications were done in Slovenian and Croatian companies, while solution is

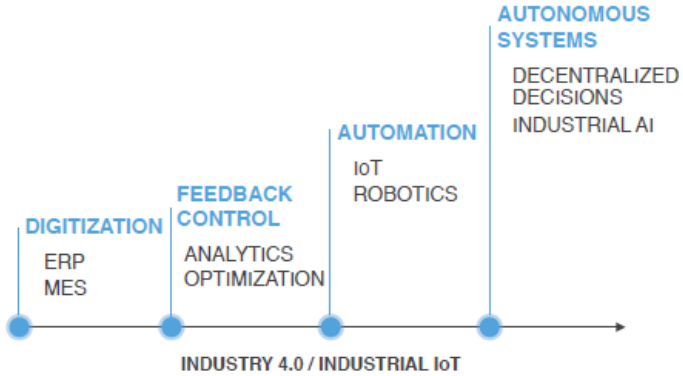
Element	Guiding questions	Answers
		actively marketed in DACH regions, where future step would be to enter the market of USA.
	Specify also the target audience/potential customers and stakeholders (stakeholders can affect or be affected)	Ideal customer: Two sizes: - Company size 1: o >100 employees o >25M annual revenue o Growing, ideally more than 20% annual growth during last 3-5 years - Company size 2: o >500 employees o >100M annual revenue o Growing, ideally more than 5% annual growth during last 3-5 years 
Targeted customers and scale of use	Select the target group of customers: 17. SMEs (<250 employees) 18. Large companies	Targeted customer are both SMEs and Large companies.

Element	Guiding questions	Answers
	19. Public institutions 20. End customer (Business to Customer) Other, please specify	
METHODOLOGICAL APPROACH		
Managerial aspects	Cost efficiency of the good practice, if applicable	Solopex SOLO saves manufacturers time and money: Planners save time by planning production-related tasks at the push of a button. SOLO computes plans that minimize wastage, overall production time, and space use in warehouses. Compared to manual processing, savings of 15% and more can be achieved for dedicated planning tasks. With SOLO's monthly subscription model, this leads to an immediate return on investment and a lasting increase in profit margins. 
	Quality assurance aspects, if applicable	Many industrial manufacturers organize production-

Element	Guiding questions	Answers
		related tasks in a manual or semi-automatic way. Human planners apply best-practice approaches or thumb rules and rely heavily on their experience. This works fine until the planning situation reaches a certain complexity, at which the human mind becomes unable to process all possible alternatives. Consequently, crucial performance indicators like material yield, machinery uptime, and system throughput drop and reduce business efficiency.
	Risk management aspects, if applicable	Taking the best planning decisions and being able to immediately react to changes and unexpected events in daily operations allows industrial clients to manufacture their products at the highest possible speed and to utilize their resources in the most efficient way.
Implementation guidelines	How can the Good practice be implemented?	Following procedure is used when implementing our solution: 4. Analysis: Analysis on how the production processes are planned (5 days) 5. Packaging into SOLO: design of algorithms which finds better planning decisions and package this algorithm into SOLO (10 days) 6. Interface: Finally, the integration to the client system is done. (3 days) By that whole process takes less than a month and it gets quicker with every new client.

Element	Guiding questions	Answers
		
	What resources are necessary for implementation (personnel, finance, infrastructure and timespan)?	Resources involved: - 3 experts who are engineers, computer scientists, and mathematicians. - Solution can be ready to use in 3 weeks (1 week analytics, 2 weeks design and implementation) - Analysis is for free, while implementation is based on customer requirements
VALIDATION PROCESS		
Validation	Provide a brief description of the good practice validation process.	The validation process was completed within the customer factory where comparison between results before and after implementation was done.
RESULTS / IMPACT		
Solution impact	What has been the impact (positive or negative) of this good practice on the beneficiaries	- Solopex Solo is providing strictly better planning descisions in a fraction of the time (1min vs 15min) - With goal prioritization, Solo can be adapted to the client's most pressing needs - In the overload situation that the client is in, a

Element	Guiding questions	Answers
		good strategy is to minimize lead times (Solo 1) in order to get shop floor operations back to a normal state - In normal operations where sales are mostly within production capacity, the primary goal should be on-time delivery (Solo 3 or 4).
SUCCESS FACTORS AND CONSTRAINTS		
Limitations and Strong points	Describe limitations, both from the technical and implementation point of view	No specific limitations were noted while implementing the solution. Specific attention should be given to the persons involved in the process of implementation, since IT knowledge is of a special importance, whereas usually processes are run by experienced experts, who lack knowledge of computer science.
	Selling points – list the real or perceived benefit of a good practice that differentiates it from the competing brands and gives its client a logical reason to prefer it over other brands	- Gain in process efficiency of 15% or more, while saving hundreds of Euros and hours of processing time - Rapid return on investment - Lasting increase in profit margins - Integrates easily with existing IT infrastructure - Does not disrupt existing processes - Adjusts to current data situation - Can manage unexpected events
Need assessment	What else would be needed in order to improve the impact of the Good practice	Nothing specific to be added.
LESSON LEARNED		
Lessons learned	What are the key messages and lessons learned to take	Solo can be adapted to the client's most pressing

Element	Guiding questions	Answers
	away from the good practice experience	needs. There is always human factor involved in this process, whereas it is important that production managers are prepared for this step and are looking into same direction as management of the company.
SUSTAINABILITY		
Sustainability of Good Practice	Describe aspects related to sustainability of the Good Practice, if applicable	The production all over Europe and world is moving into digitalization of processes into so called Industry 4.0, where Industrial AI, which is a basic of Solopex Solo represents the most advanced part of this transformation. This is why we see our product as a sustainable in the current market. 
REPLICABILITY AND UP SCALING		
Replicability and further application	How can the solution / good practice be useful for other SMEs?	SOLO has been designed for manufacturing companies in steel, plastics, aluminum, tooling, chemical, and electronics industry. This is why it can

Element	Guiding questions	Answers
		be easily tranfered to any of these production oriented companies.
	What are the possibilities of extending the good practice more widely?	So far there are no special plans on widening the scope, as we first want to start with implementation on a big scale, after that we will focus on further development of our solution.
FINAL REMARKS		
Conclusion	Conclude specifying / explaining the impact and usefulness of the good practice.	The Solopex SOLO offers customer tailor made solution to their specific production process needs, where it integrates easily with existing IT infrastructure of the customer. While implementing the solution the process is not disrupting the existing production processes so the costumer is not facing any production loss or loss of income. The start investment is easy to carry on, as it is based on subscription fee and is not representing too much of a burden for the customer.
Disclaimer / Acknowledgements	Address any legal loose ends or limitations for dissemination, certify the use of this information for dissemination, online and printed (Yes/No)	No limitations and it can be used for dissemination.

14 TEMPLATE FOR GOOD PRACTICE DOCUMENTATION

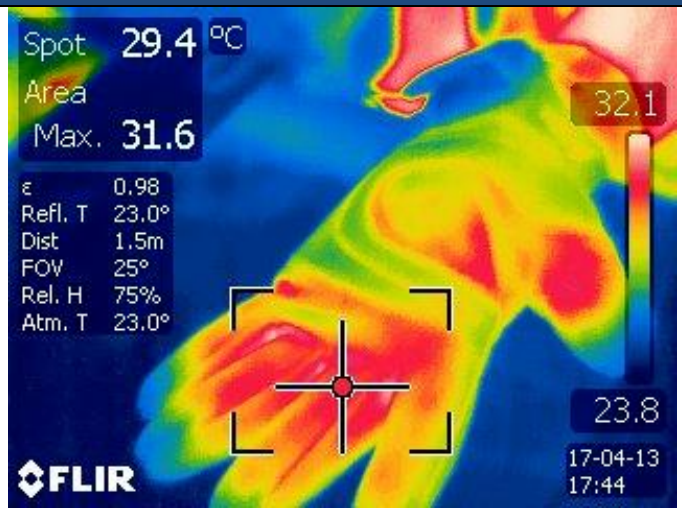
Element	Guiding questions	Answers
INTRODUCTION		
Company information	Data identification, logo, contact person, possible representative image(s).	Data identification : TITERA, technically innovative technologies, Ltd. Logo: Contact person: dr. Daniela Zavec, director Obrtna ulica 40, 9000 Murska Sobota, Slovenia E-mail: daniela@titerad.com Website: www.titerad.com
Name and brief description.	Name or acronym: what is the name that captures the essence of the good practice	With company ITP GmbH we have developed the heating under glove. 

Element	Guiding questions	Answers
	Provide a concise description of the good practice being addressed	Heating under glove can be used as a simple working glove (cool environment), combined with the additional outer layer (cold environment) or with strong insulated outer layer (extreme cold environment). Into textile are integrated temperature sensors, embroider isolative Braids on upper side and heating places over fingertips and electronic control unit, which can regulate different temperature range. A heating element are heated wires. These are sewn on textiles using embroidery technology.
GOOD PRACTICE DESCRIPTION		
Detailed description	How did the SME create good practice / new product?	TITERA bridges the gap between small sized companies and large-scale industry. It explores the everyday needs of people related with the textiles and its use. To every project we bring industry knowledge and of the best technical solution for the first batch production. We work large scale companies to produce innovative content, solutions and demonstrators by means of combining materials and technologies. A lot of innovative products developed in the research organization are usually not developed to the stage of commercialization. This often happens because of the necessary investments in the development of usable prototype, due to poorly conducted market analysis or because of the necessary knowledge needed for the positioning of the product on the market. There are

Element	Guiding questions	Answers
		also usually ill-prepared maintenance protocols, the evaluation by end-users is not designed or the knowledge to commercialize is highly inadequate. TITERA has tight collaboration with their end users, for who it develops the smart wearable products and smart composites.
	What is the relationship to SFH approach: novel technology, production processes, HRM or cost efficiency, quality assurance, risk management?	Novel technology is related to combining the wearable technology with the traditional textile technologies processes.
	Describe what are the technical solutions and innovations: of the good practice	Heating under glove can be used as a simple working glove (cool environment), combined with the additional outer layer (cold environment) or with strong insulated outer layer (extreme cold environment). This is specifically used in extreme environments where temperature is very low, for example cold store or regions where the winter is very harsh, with very low degrees. Production oriented companies faces the difficulties on how to equip workers in order to provide them decent workplace, which is why heating gloves together with heating clothes present perfect solution. Following specifications are known for low temperature heating materials: • Voltage range of 1.5 V to 230 V • Temperature range of 10°C to 100°C • Heat output can be adapted according to the customer's preferences • Advantages: rapid surface heating and energy-efficient heating compared with conventional

Element	Guiding questions	Answers
		wire heating systems Heating textiles can be manufactured with various textile manufacturing technologies. Energy supplies two batteries with 7,4 V and power 15 W. Booth gloves can be charged at the same time. Glove-electronic is made in two options: - With integrated temperature sensors for control and regulation. - Option ON/OFF – without integrated temperature sensors. 

Element	Guiding questions	Answers
		

Element	Guiding questions	Answers
		
	Highlights (or keywords) of the Best Practice	Specific keywords: textile, temperature sensors, heated wires, embroidery technology
	Good practice applied in : (NACE code)	C13 - Manufacture of textiles
Benchmarking	How does your solution related to others provided by competitors	Existing products for heating elements are mostly integrated into the outer garment. Carbon fibres are replacing embedded heating wires, which are rigid and heavy, break easily, and require more energy. Making use of low voltages for safety, electrically heated clothing comes with a button on the outside which enables the regulation of the heating system. Heating is achieved through the integration of the heating pads

Element	Guiding questions	Answers
		based on metal wires weaved into the surface. At the moment such heating kits have to be taken out of the garment item while washing. Our heating elements can be washed.
Additional information's / materials	Provide additional information if existing such as case studies, datasheets, whitepapers, awards and other relevant information. Electronic sources (websites, social media, pictures, videos) are encouraged to be included in this section. Training manuals, guidelines, technical fact sheets, posters, pictures, video animations, audio documents, 3D files, and/or other material about the Good practice implementation (if existing).	
OBJECTIVE AND TARGET AUDIENCE		
Geographical coverage and target audience	What is the geographical range where the good practice has been used / tested / validated: country, region, Danube Region if is relevant and possible	Slovenia, Prekmurje Germany, Thüringen
	Specify also the target audience/potential customers and stakeholders (stakeholders can affect or be affected)	Workers in a cold environment
Targeted customers and scale of use	Select the target group of customers: 21. SMEs (<250 employees) 22. Large companies 23. Public institutions 24. End customer (Business to Customer) Other, please specify	1. SMEs (<250 employees) 2. Large companies 3. Public institutions 4. End customer (Business to Customer)
METHODOLOGICAL APPROACH		
Managerial aspects	Cost efficiency of the good practice, if applicable	No special cost efficiency noted.

Element	Guiding questions	Answers
	Quality assurance aspects, if applicable	Product can positive impact the human health. Workers can work longer while exposed to cold environment. While feeling comfortable in cold environment, the work efficiency will be higher.
	Risk management aspects, if applicable	Battery.
Implementation guidelines	How can the Good practice be implemented?	There are no special implementation rules, as product is ready to use. So it is just a matter of reading the instructions on how to use it.
	What resources are necessary for implementation (personnel, finance, infrastructure and timespan)?	There is a need for appropriate sewing equipment which needs to be implemented into traditional manufacturing facilities.
VALIDATION PROCESS		
Validation	Provide a brief description of the good practice validation process.	Validation in our case can be performed through quality check process in a final step of production. Positive feedback from end users.
RESULTS / IMPACT		
Solution impact	What has been the impact (positive or negative) of this good practice on the beneficiaries	The big advantage for people who work or play outdoors is that heated clothing keeps them warm during breaks in activity, when body temperature can decrease quickly. They will feel comfortable.
SUCCESS FACTORS AND CONSTRAINTS		
Limitations and Strong points	Describe limitations, both from the technical and implementation point of view	Today's technical limitations are related to the lack of appropriate sewing machines needed for placing a metal wires over textile layer. Automatization process is required, but not possible yet.

Element	Guiding questions	Answers
	Selling points – list the real or perceived benefit of a good practice that differentiates it from the competing brands and gives its client a logical reason to prefer it over other brands	The presented heating glove is the only one that kind of type. It consists of two layers. It can also be washed.
Need assessment	What else would be needed in order to improve the impact of the Good practice	The product is developed and ready for market, but there is lack of promotion about “smart” textiles. So there still needs to be some work done in order to present the benefits of such best practices.
LESSON LEARNED		
Lessons learned	What are the key messages and lessons learned to take away from the good practice experience	Being innovative on every step is needed in all industrial environments. The cooperation between research, business support organizations and end-users (production companies) is needed in order to develop the product which is ready for the market and acceptable by the market.
SUSTAINABILITY		
Sustainability of Good Practice	Describe aspects related to sustainability of the Good Practice, if applicable	The market of “smart” textile is being developed rapidly and it is just a matter of time, when each of the production line will be using one or another implication of those kind of materials.
REPLICABILITY AND UP SCALING		
Replicability and further application	How can the solution / good practice be useful for other SMEs?	Once the technology can be adopted in serial production of heating gloves, also other protective garment items can be produced by the same technology. Transfer the technology on other type of products is welcome.

Element	Guiding questions	Answers
	What are the possibilities of extending the good practice more widely?	Researching, developing, creating and demonstrating innovative solutions in the field of the smart textile and wearable electronics, personal protection equipment, thermoregulation and human thermal comfort will bring more and more possible applications. By spreading the technology on other products for personal protection.
FINAL REMARKS		
Conclusion	Conclude specifying / explaining the impact and usefulness of the good practice.	The heated gloves play an important role in the tough environments, where the temperature is very low. In order to ensure the healthy environment and workers satisfaction and by that also the production efficiency with added value it is important to implement such smart products, which are already on the market and are changing the everyday of workers.
Disclaimer / Acknowledgements	Address any legal loose ends or limitations for dissemination, certify the use of this information for dissemination, online and printed (Yes/No)	No limitations.