APPROACH FOR THE SYSTEMATIC TRANSITION OF THE COMPANY INTO INDUSTRY 4.0

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Abstract

Industry transforms its production and business models according to Industry 4.0 concept, a current trend of automation and data exchange in manufacturing technologies that includes cyber-physical systems, the Internet of things/services, cloud and cognitive computing. Digital maturity is the ultimate precondition for transition. Intralogistics, an ubiquitous activity inside every company, consequently follows this trend and expands the concept of industry 4.0 in the field of logistics. In doing so, traditional companies have to lead their development along the evolutionary path, on which they are faced with a lack of examples of good practice that might be followed. They can use maturity models, but the use of these often requires the involvement of consulting firms. Maturity models are supportive tools to assess the AS-IS state, derive and prioritize improvement measures and control the progress. With the awareness of the inadequacy of merely the use of maturity models for the transition in industry 4.0, we began to evolve complementary tools.

The paper examines the applicability of the maturity model, more specifically The Digital Maturity Model 4.0, in combination with Business Process Modelling and the AS-IS state analysis in the light of the technological upgrading according to Industry 4.0 guidelines on specific case study in Tooling manufacturer. The paper concludes that the maturity model is useful for general diagnostics, but for more detailed planning of further development steps analytics at the process level is needed.

Key words: industry 4.0, maturity model, business process modelling, Digital Maturity Model 4.0

1. INTRODUCTION

In line with rapidly changing customer demands, ever-intensified market competition, growing product complexity and demanding legal requirements, there is a high demand on improved production efficiency, product quality, energy consumption and cost containment for manufacturing companies (Vrečko et al, 2019). In response to this, Industry 4.0 is ubiquitous. According to the German Industry 4.0 Working Group, Industry 4.0 revolves around “networks of manufacturing resources that are autonomous, capable of controlling themselves in response to different

situations, self-configuring, knowledge-based, sensor-equipped and spatially dispersed" (Kagermann et al., 2013). The need to speed up digitization and digital transformation is more than obvious (Sommer, 2015). Like in other areas, also in production Industry 4.0 is transforming the way companies think about how their operations can and should be run. The above definition and indicated trends can be helpful for companies on their path to Industry 4.0, but it can also cause a sense of helplessness, lack of knowledge and irrational investment (Sternad, 2018). The rapid development of information technology and technology in general makes it even more difficult to find optimal routes and solutions. Advancements in robotics, virtual and augmented reality (Vujica Herzog et al., 2018), sensor technology, along with the significant growth of the Industrial Internet of Things allow many industries to connect machinery and human workers in ways never seen before. Improved efficiency brings vast cost savings and reduces the unpredictability of events due to human involvement and lack of data in real time. Once again, planning a path to these positive effects is in the hands of individual companies that do not have the opportunity to copy good practices. One of recurring questions is how to achieve digital and Industry 4.0 maturity or what needs to be done. Solution providers are heralding digitalisation and Industry 4.0 as the great answers to all problems, but few are providing honest and achievable strategies for introducing them into industrial environments. The digitalisation and Industry 4.0 projects usually come with significant investment (Jereb, 2017) and overhaul of current operations, which for most companies is an insurmountable challenge.

Paper contributes to answering the question how can companies get started with digitalisation and Industry 4.0 projects. From previous research (Sternad et al., 2018) we learned about the usefulness of maturity models, and at the same time also about their failure to give companies the exact directions of what to develop. In the case study, we compare the results of using the maturity model and business process modelling. Business process modelling is the activity of representing company's processes, so that the current process may be analysed, improved, and automated (Aguilar-Saven, 2004).

In paper, we answer the following research questions:

RQ1: Are there any similarities/differences in results from digital maturity assessment and results from analysis of business process model?

RQ2: Can analysis of business process model complement maturity model's general guidelines with more details?

The actuality of the problem demonstrates also the contribution of Prinz et al. (2016), who have written about LPS-learning modules for Industry 4.0. They propose the development of so-called 'audit/maturation module'. The idea is to support companies systematically with the transformation to an Industry 4.0. Every company has to develop its own schedule of how to create the design fields of technology, organization and staff. Their module will also include some kind of maturity model.

2. METHODOLOGY

Literature review was used to learn about the methodology of assessment using the Digital Maturity Model 4.0 and the characteristics of the workplace according to the guidelines of the Industry 4.0. The theoretical background about maturity models was set from scientific papers found in Google scholars, Web of Science and Elsevier.

The selected maturity model (The Digital Maturity Model 4.0) was used on the example of a Tooling manufacturer. In the company, we surveyed the project manager, head of production and the IT manager. A self-assessment tool in a form of questionnaire consists of 28 statements, 7 in each dimension (Figure 1). Respondents marked on a 4-point scale how much do they agree with each of the statements (0 - completely disagree, 1 - somewhat disagree, 2 - somewhat agree, 3 - completely agree). The sum of points places assessed company in one of four classes: a skeptic, adopter, collaborator, or differentiator.

Figure 1. Questionnaire

"How much do you agree with each of the following statements?"

0 = Completely disagree 2 = Somewhat agree
1 = Somewhat disagree 3 = Completely agree

	Culture
	We believe that our competitive strategy depends on digital
	Our board and our C-level executives back our digital strategy
	We have the right leaders to execute on our digital strategy day-to-day
	We invest in targeted digital education and training at all levels of our organization
	We clearly communicate our digital vision both internally and externally
	We take measured risks in order to enable innovation
	We prioritize overall customer experience over the performance of any individual channel
	Organization
	Our organization structure prioritizes customer journeys over functional silos
	We dedicate appropriate resources to digital strategy, governance, and execution
	The staff supporting our critical digital functions are best in class
	We have digital skills embedded throughout our organization
	Our organization model encourages cross-functional collaboration
	We have defined and repeatable processes for managing digital programs
	Our vendor partners deliver value that enhances our digital competencies
	Technology
	Our technology budget is fluid to allow for shifting priorities
	Our marketing and technology resources work together to co-create our digital technology road map
	We have a flexible, iterative, and collaborative approach to technology development
	We leverage modern architectures (APIs, cloud, etc.) to promote speed and flexibility
	We measure our technology teams by business outcomes not just system up-time
	We use customer experience assets, like personas and journey maps, to steer our technology design
	We use digital tools to promote employee innovation, collaboration, and mobility
	Insights
	We have clear and quantifiable goals for measuring the success of our digital strategy
	Every employee understands how her performances ties to corporate digital goals
	We use customer-centric metrics like Net Promoter Score or lifetime value to measure success
	We measure how channels work together to accomplish a desired outcome
	Customer insight actively steers our digital strategy
	Customer insights inform digital design and development
	We feed lessons learned from digital programs back into our strategy

Source: Gill & VanBoskirk, 2016

In parallel, with the help of Business Process Modeling, we recorded the AS-IS process state and critically evaluated it. With the help of employees, we defined the main phases of the business process, which add value for the client. A guided tour along reference workplaces on the value chain from the tool order to the verification of the tool at the customer's plant was organized. Process data were gathered with partially structured interviews with employees on reference workplaces, and presented with synoptics (Figure 2).

Figure 2. Example of synoptic

ACTIVITY/TASK	Input		EXECUTION	
Flow Chart for workplace: **TOOLMAKER**	Data: • paper/oral communication/e-mail/signal... • electronic/paper... • send to a worker/has to be pick it on remote place...	Material: • type • delivery method	Executor: • worker/matchine/vehicle/tool... • location • visible/need for searching	Time: • Cycle time • in % according to the entire process • disturbances
The tool is assigned to the toolmaker **P1.TO**	**Toolmaker receives a plan:** • • paper document (also available electronically on a shared computer in the assembly - small display diagonal, 5 tool-makers per 1 computer) • • an explosion drawing with an illustrated sequence of installation of elements with unique markings of each individual assembly	No	Toolmaker	- 0.5 h - 5% - computer is busy - need for walking to the computer - not all the data is in paper documentation

Source: author

In the critical evaluation of the AS-IS state (Figure 3), we analysed each individual activity within the process. We were interested in whether the activity is routine / repetitive, ergonomically unacceptable, unnecessary, without added value, it represents a loss in terms of lean paradigm, technologically upgradable from manual to machine, using paper documents. Each positive answer was followed by proposal for improvement.

Figure 3. Example of synoptic

Task ID in the synoptic	Task name	AS-IS	Potential for Industry 4.0	
P1.T1	Getting acquainted with a work order	Use of the bill of material (paper document), 2D construction drawing (paper document), 3D electronic model	Augmented reality	**All information from a single source.** The use of virtual reality: posibility of rotation, an exploding view, a view of the whole or an individual part, the coloring of groups of components (eg. purchased parts) 
			AGV	
			Collaborative robot	
P1.T2				

Source: author

Further on, for each workplace similar tasks were grouped within a single row of proposal to improve the AS-IS state of specific workplace towards digital and Industry 4.0. Doing so, a transparent and concise proposal is made. One row of such proposal for Toolmaker's workplace is presented in Figure 4.

Figure 4. A part of the result from a critical analysis for a workplace "Toolmaker"

Activity with potential to Industry 4.0	ID Task	Task name	The effect of the TO-BE state	Description of the solution
Internal transportation	P1.T3	Moving castings / components from machining to assembly	The toolmaker is relieved of walking and carrying/transporting pieces between workplaces. Manual transportation is automated.	 Collaborative robot/AGV/mobile collaborative robot: • detects the completion of the previous phase, loads the piece and transports it to the next destination • operates on a call, allows worker to enter a command) to be fullfilled (eg. M10x20 or job destination).
	P1.T8	Carry in hands / transport of castings / pieces from the assembly into the heat treatment room		
	P1.T10	Moving parts from BPT to assembly		
	P1.T12	Moving parts from assembly to BKC/EŽ		
	P1.T14	Carry in hands/transport of pieces in the assembly		
	P1.T16	Carry in hands/transport of standard screws in the assembly DM		
	P1.T18	Carry in hands/transport of purchased goods from warehouse to assembly workplace		

Source: author

Based on the results from maturity assessment and critical analysis of AS-IS state, we answered research questions.

3. THEORETICAL BACKGROUND

3.1. The Digital Maturity Model 4.0

Software Engineering Institute has launched the Capability Maturity Model (CMM) more than twenty years ago (Paulk et al., 1993). This model became the basis for most maturity models that we know today. Based on the assumption of predictable patterns of evolution and change, maturity models usually include a sequence of levels that together form an anticipated, desired, or logical path from an initial state to maturity (Pöppelbuß & Röglinger, 2011). A maturity model serves:

- a descriptive purpose of use if it is applied for AS-IS assessments where the current capabilities of the entity under investigation are assessed with respect to given criteria (Becker et al., 2009)
- a prescriptive purpose of use if it indicates how to identify desirable maturity levels and provides guidelines on improvement measures (Becker et al., 2009).

Forrester's Digital Maturity Model 4.0 is one of several maturity models that help companies assess their overall digital readiness (Gill & VanBoskirk, 2016). It evaluates digital sophistication across four dimensions:

- culture (a company's approach to digitally driven innovation, and how it empowers employees with digital technology);
- technology (a company's use and adoption of emerging technology);
- organisation (how aligned a company is to support digital strategy, governance, and execution);
- insights (How well a company uses customer and business data to measure success and inform strategy).

The evaluation is carried out by completing the pre-prepared standard form. Respondents mark on a 4-point scale how much do they agree with each of the 27 statements. The sum of points places the company in one of four classes: a skeptic, adopter, collaborator, or differentiator. The result should help determine a starting point for company's digital strategy (see Figure 5).

Figure 5. Companies distribute into four maturity segments

Maturity segment	Characteristic behavior	Strategy	Score range
Differentiators	Leveraging data to drive customer obsession.	Blend the digital and physical worlds.	72-84
Collaborators	Breaking down traditional silos.	Use digital to create competitive advantage.	53-71
Adopters	Investing in skills and infrastructure.	Prioritize customer relationships over production.	34-52
Skeptics	Just beginning the digital journey.	Prompt a willing attitude.	0-33

Source: Gill & VanBoskirk, 2016

Explanation of classes (Gill & VanBoskirk, 2016):

- Skeptics are technology-sluggish firms — skewed toward extremely large financial services, telecom, and public sector firms — that have limited experience innovating or applying an outside-in approach to strategic planning.
- Adopters have more digital practice than Skeptics do. In response to initial return from digital marketing and sales channels, they are willing to invest in the base architecture they need to scale their digital ambition — like a CRM system or e-commerce platform. Even so, most adopters are manufacturers, utilities, or healthcare companies that prioritize production over customer relationships.
- The greatest identifier of Collaborators is that firms in this segment are significantly more apt to collaborate internally and externally to enable practice and innovation with digital. 95 % of Collaborators emphasize the overall customer experience of their brand over the performance of any individual channel.
- Differentiators report strong revenue growth and tend toward pure-play or heavily online-focused retailers who are consistently more skilled than average at all the marketing and eBusiness functions we considered in this study, including project management, customer insights, and direct marketing.

3.2. Properties of Workplace 4.0

Howaldt et al. (2017) start their discussion: "Behind labels like "smart manufacturing" and "advanced manufacturing", hides the attempt to accelerate the digitalisation of production. In Germany, the future of manufacturing is intimately

bound up with the vision of Industry 4.0. Wide scale implementation of this technology-centred vision appeared to be necessary and crucial for competitiveness."

Many companies are currently facing the challenge that plenty of technologies like the information and communication technology are indeed available but the companies, i.e. the individual employees, are not prepared for a successful use of Industry 4.0 (Prinz, 2016). Industry 4.0 differs from the approach of computer-integrated manufacturing (CIM) of the 1980s concerning the human role in the production environment. Whereas CIM considered the workerless production, the human role in Industry 4.0 is still very important and essential (Hirsch-Kreinsen, 2014). The success of human collaborative behaviour is based on individual's competences in interdependent functions (Topolšek, Čižman & Lipičnik, 2010). As a result of the interlinking of cyber-physical systems in Industry 4.0, the real-time depiction of all processes in a factory is now possible (Spath et al., 2013). For this reason, employees on the production planning and control level will be confronted with a high amount of information and data, generated by the entire infrastructure of cyber-physical systems. Besides, it can be assumed that formerly separated tasks and competences will merge (Spath et al., 2013). The increasing complexity of work will also concern the shop floor level. As simple tasks will be more and more automated, the remaining tasks will mostly consist of problem solving. For the human operator, mastering this complexity requires larger amounts of knowledge and competences than ever before (Ullrich et al., 2015). Digitized processes allow human independent control and automated communications between technical systems, which are becoming more responsive and reliable. Flexibility is being improved with adding interconnected multifunctional machines, robots and autonomous vehicles in production environment to implement the strategy of covering market niches and to satisfy customers' individual demands. Non-digitized data is becoming an obstacle to reach the maximal effects of transformation of traditional industrial environment into industry 4.0.

Industry 4.0 is a transformation that is powered by nine foundational technology advances: augmented reality, big data and analytics, autonomous robots, simulation, horizontal and vertical system integration, the industrial internet of things, cybersecurity, the cloud, additive manufacturing (Gerbert et al., 2015). Demand for employees in the mechanical-engineering sector may rise by as much as 10 percent. Employment growth since 2001 has been entirely based on jobs that have no repetitive tasks. The growing use of software, connectivity, and analytics is increasing the demand for employees with competencies in software development and IT technologies, such as mechatronics experts with software skills.

4. RESULTS

4.1. Assessment results with the Digital Maturity Model 4.0

The purpose of presenting the assessment results is not their precise explanation. The interpretation is very subjective and depends on the skills of the analyst. The main purpose is to show the generality of the collected data when using one of maturity

models on practical case. From theory, we know that since their provenance, maturity models have been subject to criticism (Pöppelbuß & Röglinger, 2011). Characterized as "step-by-step recipes" they oversimplify reality and lack empirical foundation. We indicate the need for use of complementary techniques for the proper determination of maturity.

The assessment results are presented separately for each of four dimensions.

4.1.1. Culture

Results from assessment on dimension Culture are presented in Table 1. The respondents (project manager, IT manager, a head of production) from researched Tooling comapany agree that the employees' priority is the excellent experience of their clients with the whole process, and not only with a certain phase. This statement is assessed with three points on a scale from 0 to 3. Excellent customer experience with the entire process is an important area in Tooling company, where constant improvements are expected to improve products (tools for presses) and cycle time.

The respondents are also united that their company adopts moderate risks in the company in order to promote innovation. This is due to the nature of their products and their efford to preserve competitive advantage. Tooling companies are known for their innovation at producing tools. But digital maturity require inovativnes of digital transformation, which is new for this type of industry.

The employees have the most unequal opinion about planned investment in education and training on digitisation/e-commerce. The result points to a different intensity of training by individual departments.

Table 1. Maturity assessment on dimension Culture

Culture	Project manager	IT manager	Head of production	Average score
We believe that our competitive strategy depends on digital	3	2	2	2.33
Our board and our C-level executives back our digital strategy	3	2	2	2.33
We have the right leaders to execute on our digital strategy day-to-day	2	1	2	1.67
We invest in targeted digital education and training at all levels of our organization	3	1	3	2.33
We clearly communicate our digital vision both internally and externally	3	2	2	2.33
We take measured risks in order to enable innovation	2	2	2	2.00
We prioritize overall customer experience over the performance of any individual channel	3	3	3	3.00
Total	19	13	16	16.00

Source: Questionary from Gill & VanBoskirk (2016), results from survey by Author

The high level of agreement and mutual consistency was demonstrated by the following statements:

- we believe that our competitive strategy depends on digital;

- our board and our C-level executives back our digital strategy;
- we clearly communicate our digital vision both internally and externally.

The respondents partially agree (1.67 on a scale from 0 to 3) that they have the right leaders to execute on their digital strategy day-to-day. At the forefront of the company's efforts is a product, an excellent tool, and less a digital transformation.

4.1.2. Organisation

Results from assessment on dimension Organisation are presented in Table 2. The respondents do not share the same opinion on offered statements. The lowest score was assigned to "We have defined and repeatable processes for managing digital programs". The most defined and repeatable process is tool production from customer's order to assemly at the customer's hall. A minority od digital projects are guided by the same principle as other development projects. The result points to the weakness or even the absence of a digital strategy.

The respondents do not have the same opinion on the claim "The staff supporting our critical digital functions are best in class". The result indicates respondents' uncertainty. Each of respondents is faced with a dilemma: Am I familiar with what is happening in the company? Only well informed staff would know that company does not have digital functions; has no electronic store for its products, e-commerce with partners is limited, it does not have a department for processing digital data. A large amount of data is not in a digital form. Consequently, the need for excellent staff with digital competencies is also limited.

Table 2. Maturity assessment on dimension Organisation

Organisation	Project manager	IT manager	Head of production	Average score
Our organization structure prioritizes customer journeys over functional silos	3	2	3	2.67
We dedicate appropriate resources to digital strategy, governance, and execution	3	2	2	2.33
The staff supporting our critical digital functions are best in class	3	1	2	2.00
We have digital skills embedded throughout our organization	3	1	1	1.67
Our organization model encourages cross-functional collaboration	3	2	2	2.33
We have defined and repeatable processes for managing digital programs	2	1	0	1.00
Our vendor partners deliver value that enhances our digital competencies	2	2	1	1.67
Total	19	11	11	13.67

Source: Questionary from Gill & VanBoskirk (2016), results from survey by Author

The respondents share quite the same oppinion on four statements in Table 2. Business partners are a driving force that enhance digital competencies, especialy on vendor side. For example, some customers require the use of their electronic templates for shared documents. Partly, business partners can help to increase the digital

competences of specific company, but that is not an assurance for electronic commerce between partners.

Results partly support statement that organizational model in researched company promotes inter-departmental collaboration. All departments tend to produce an excellent tool and satisfy customer. The tool often travels through the business process backwards due to the need for changes. That also contribute to improved collaboration.

Supporting services, such as informatics, feel a little less contribution to the customer experience. The contribution of IT to the excellent customer experience will probably be enhanced by the digital transformation of the company.

4.1.3. Technology

Results from assessment on dimension Technology are presented in Table 3. The respondents have the same opinion (partly agree 2.0 on scale from 0 to 3) about the statement „We measure our technology teams by business outcomes not just system up-time" (Table 3). Sales revenues are a key measure of success. Employees collectively contribute to maximizing the impact of their work. In doing so, they do not rely on digital technologies. In reearched company, the potential of introducing digital technologies is not explored.

Table 3. Maturity assessment on dimension Technology

Technology	Project manager	IT manager	Head of production	Average score
Our technology budget is fluid to allow for shifting priorities	3	2	2	2.33
Our marketing and technology resources work together to co-create our digital technology road map	3	2	2	2.33
We have a flexible, iterative, and collaborative approach to technology development	3	2	2	2.33
We leverage modern architectures (APIs, cloud, etc.) to promote speed and flexibility	2	2	1	1.67
We measure our technology teams by business outcomes not just system up-time	2	2	2	2.00
We use customer experience assets, like personas and journey maps, to steer our technology design	3	2	2	2.33
We use digital tools to promote employee innovation, collaboration, and mobility	3	2	2	2.33
Total	19	14	13	15.33

Source: Questionary from Gill & VanBoskirk (2016), results from survey by Author

Respondents have less unified opinion about all other statements in Table 3. The average values of the individual statements above 1.5 report partial agreements and higher level of digital maturity.

4.1.4. Insights

Results from assessment on dimension Insights are presented in Table 4. The respondents have the same opinion (completely agree 3.0 on scale from 0 to 3) only about the statement „Customer insights inform digital design and development". Employees agree that knowing the customer is crucial to business success. Result reports a mature state. Consequently, the modest use of customer-centric metrics to measure success in their company is surprising and rises a question about the method of data collection.

The applicability of claims given to statement „Every employee understands how his/her performances ties to corporate digital goals" is rather questionable because it contains values from 1 - somewhat disagree to 3 - completely agree. Probably employees who work on development projects are more familiar with corporate digital goals than others are.

A great deal of disagreement was found also about the statement „We measure how channels work together to accomplish a desired outcom", from 1 - somewhat disagree to 3 - completely agree. Dialogue with business partners takes place through meetings, phone, email and electronic partners' environments. The customer always determines communication. The diversity of answers probably indicates a lack of customer-centric metrics in use.

The respondents have a fairly uniform opiniona regarding all other statements on dimension Insights.

Table 4. Maturity assessment on dimension Insights

Insights	Project manager	IT manager	Head of production	Average score
We have clear and quantifiable goals for measuring the success of our digital strategy	2	1	1	1.33
Every employee understands how her performances ties to corporate digital goals	3	1	1	1.67
We use customer-centric metrics like Net Promoter Score or lifetime value to measure success	2	1	1	1.33
We measure how channels work together to accomplish a desired outcome	3	1	2	2.00
Customer insight actively steers our digital strategy	2	3	2	2.33
Customer insights inform digital design and development	3	3	3	3.00
We feed lessons learned from digital programs back into our strategy	3	3	2	2.67
Total	18	13	12	14.33

Source: Questionary from Gill & VanBoskirk (2016), results from survey by Author

4.1.4. Company's digital maturity

According to assessment results with the Digital Maturity Model 4.0 (Table 5), the expected degree of maturity in researched company is somewhere between "adopter" and "differentiator" (Figure 1). The average score (59) places the company on level "collaborator", which is one level more than notes the author of the maturity model

for comparable companies (Gill & VanBoskirk, 2016). According to theory, the project manager was too optimistic, while the other two respondents were realistic.

Table 5: Positioning the company on a maturity scale

	100 % digital maturity [max score]	Project manager	IT manager	Head of production	Average score
Culture	21	19	13	16	16
Organisation	21	19	11	11	13
Technology	21	19	14	13	15
Insights	21	18	13	12	14
Total	84	75	51	52	59
Maturity level	Diferenciator	Diferenciator	Adopter	Adopter	Collaborator

Legend: Highest Score
Lowest score

Source: author

The result of the survey did not prove to be trustworthy or adequate to be used for decision making or defineing company's digital strategy.

4.2. Analysis of AS-IS state

A Business Process Modeling was used to record the AS-IS process state and critically evaluated it. Some of the main findings are presented below.

Observation of activities along the value chain, from customer's order to the final assebly in customer's production plant, shows the dominant presence of oral communication and paper documents (drawings, bill of material). 1/3 of machines is stil clasical, without NC or CNC controle, which means a communication barrier during technological preparation (CAD) and manufacturing (CAM).

A toolmaker, as a worker with a crucial assignment of assembly, is spending at least 1/5 of his time on work for walking arround the shop flour in order to verify the status of manufacture process, transfer pieces between machines, supply with material. Alphanumeric designations are still wtritten manually on tool's components (marker, scratching, stamping of individual characters) although there is a possibility of laser marking. Screwing is also manual. Several assebly workpalces on cca 200 m^2 have one computer, pneumatic screwdriver, storage rack for screws, which is reflected in the increased need for walking. Locations of tool's components within the production plant are not known, which results in occasional search activities.

Collaboration or collaborative behaviour presents an important aspect of company success (Topolšek, 2011). Communication between departments in researched company is mostly oral, with the exception of the flow of data about the tool's model, its structure and technological process. As a result, employees have a stronger sense of cooperation at the expense of lower productivity. It seems that oral communication between employees gives rise to innovation.

Digitalization and digital transformation of business processes between partner is in starting phase. A digital communication between partners develops due to the requests of external partners to use their electronic templates and safe repositories for common documents. Partly, this contributes to increasing the digital competence of researched company, but we can not yet talk about e-commerce or digital communication between partners.

Company's web page is static rarely updated, electronic communication in social networks almost does not exist. In the recruitment of newcomers, emphasis is placed on occupational specific competences, digital are not even mentioned in job descriptions. Formal digital strategy is not existing.

The analysis of AS-IS state gave us very detailed informations about company's organisation, processes, resources, shop floor and other. Its weakness is, that it is not directing to collecting specific data needed for assessment of company's digital maturity.

5. DISCUSSION

Based on the case study, we mainly notice differences in methods and results between maturity assessment based on maturity model and analysis of AS-IS state designed by business process modelling. Maturity assessment uses questionnaire while analysis of AS-IS state uses partially structured interview and the predesigned form for process visualisation. Results from maturity assessment are presented numerically with score, while results from analysis of AS-IS state are presented with flow charts and text. The only similarity lies in the fact that both methods describe the current state for some targeted purposes in the future, such as improving key business indicators, preparing a strategy, searching for alternatives, etc.

Getting data with digital maturity assessment is highly targeted on digital, while the other approach tries to obtain as many different data as possible at the lowest level of process structuring, that is, at the level of the task. The weakness of the first approach lies in the fact that something important can be overlooked, while the other method collects to many data. When using a maturity assessment it is necessary to select very knowledgeable respondents who fully understand each technical term in a questionnaire. The results are during the evaluation process already prepared in a form for immediate use, which does not require a presence of expert with long-term practice or specific training. When practicing analysis of AS-IS state designed by business process modelling the situation is different. Observed employees have excellent understanding of their work, they do not need to knowledgeable. The observer examines different documents, conducts a time study, retrieves data from the ERP or other expert data systems, conducts interviews with a large number of employees, and does not ask them the same questions, but only issues that directly regard to their work areas. The observer must be a resourceful person, often with many years of practical experience, who masters work with data and business analytics, has the talent to oversee opportunities and is a great connoisseur of latest business models and global trends.

The case study confirms complementarity of digital maturity assessment and analysis of AS-IS state designed by business process modelling. Results from analysis of business process model complement maturity model's general guidelines with more details. In this way, we can validate the estimated level of digital maturity and effectively approach to the improvement of the current state.

6. CONCLUSIONS

The maturity model, more specifically The Digital Maturity Model 4.0, business process modelling and the AS-IS state analysis can be used as complementary methods in cases when digital maturity has to be defined. Their co-use increases the reliability of the result and gives a better starting point for further development. The digital maturity model is useful for general diagnostics, but for more detailed planning of further development steps analytics at the process level is needed.

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