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## **THE APPEARANCE OF DIGITALISATION AMONG THE VIEWPOINTS OF BALANCED SCORECARD**

### **Abstract:**

In the early 1990s, Robert S. Kaplan and David P. Norton developed a balanced evaluation- and index-system that supports the implementation of the strategy. This strategic control tool is the Balanced Scorecard which approaches and evaluates the company's activities and strategy from several perspectives, viewpoints. Today, one of the most important trend is the Industry 4.0 which creates intelligent, networked value chains through cyber-physical systems. Planning and deploying this is not easy but as a strategic issue it must appear in the Balanced Scorecard. Indicators to assist in the implementation of Industry 4.0 should be built in. We are reviewing the importance of Industry 4.0 and developing a Balanced Scorecard model that includes the factors that help to implement the strategy at Industry 4.0.

### **Keywords:**

Strategy, Balanced Scorecard, Industry 4.0, Digital Business Model

**JEL Classification:** L10, L21, L60

## 1 Introduction

Every company needs a strategy that includes longer-term visions and targets. In the early 1990's, Robert S. Kaplan and David P. Norton, together the U.S. management consultancy firm Nolan, Norton & Co. (acquired by KPMG), developed a new and balanced strategic scorecard system, the Balanced Scorecard (hereinafter referred to as BSC) (Kaplan, Norton, Dorf, Raitanen, 1996.).It broke up with the features of the previous strategy support systems; which were focusing solely on financial indicators. The classic BSC evaluates the requirements of performance (top-down approach) in four aspects which were formulated by the vision and strategy; but at the same time examines and controls the implementation of the strategy starting from the internal performance (bottom-up execution).This system has been transformed several times to this day, it is constantly evolving.

Of course, there are no two identical BSCs, each company adapts and occasionally changes it periodically. As any strategy support tool, this must also be in line, so meet with changes and new trends. One such trend is Industry 4.0, which is challenging the BSC with the appearance of Cyber-Physical Systems, Big Data, Data Mining, Smart Factories etc. The value chain is part of today's economy and companies as well, but in changed form, so altered only.

In my opinion, therefore, the BSC needs to adapt to this trend; the factors and features of Industry 4.0 must be applied to become it a truly modern tool in corporate governance. We examine what are the factors that need to include the new BSC and how it affects the development and viewpoints of BSC. We create a model and a strategic map that is well-prepared for Industry 4.0 and can be a modern strategy support and control tool in the 21st century.

## 2 BSC - The basics

For businesses, it is an important goal to earn the expected profit of course, but it must be remembered that achieving this goal is possible only with satisfied customers, motivated and efficient employees.Hence, the issue of customer and intellectual capital, employee responsibility and commitment has come to the fore.

These changes pose a challenge to the leaders of enterprises.Innovation, skills development, flexibility and uniqueness have become very material.Adapting to a dynamically changing environment has led to changes in driving methods."In the 1990s, companies expanded the financial framework for financial indicators that were more closely linked to the shareholder value which led to the development the concept of Economic Value Added and to the value-based leadership.However, even today's most outstanding financial index systems are unable to express the dynamics of the performance required for today's knowledge-based competition."(Kaplan, Norton, 2002.)

Before the development of the BSC, companies have realized that not only financial indicators should be considered.Based on their practical experience, some non-financial indicators were selected,which they thought usefulthis system is called

spontaneous scorecard. Such kind of spontaneous scorecards have many companies however, this system can be called unbalanced, as the indicators of financial and customer viewpoints are dominant. Imbalance is also the case if the indicators are not separated for diagnostic and scorecard indexes. Monitoring a status is diagnostics but if we look at how much time and what was needed for observe the status, that's scorecard. We may also call the scorecard system spontaneous or incomplete if there are indicators from the other two (learning / development and internal processes) dimensions but they do not form an integrated system with each other and with the functional areas of the company. It is also a problem if the indicators are not consistently related to the strategy, however at the heart of the BSC is the implementation of the corporate strategy and vision (Boda, Szlavik, 2001.).

Strategy is important, but more important is its implementation. Implementation and monitoring of the strategy are based on measurements. On the one hand we can examine the success of past decisions, secondly we can determine the expected direction of future performance for the company. The develop and operation of this measurement system is not a simple task as many non-financial areas have to be investigated. There are much less objective indicators in these areas (e.g., employees' commitment to the company's goals or the development of company's suppliers).

The other problem is that companies do not or just have difficulty to understand the cause and effect relationships between organizational and individual performance factors and to make a contribution to development from this relationship.

In 1990, KPMG's research institute in cooperation with the leaders of Anglo-Saxon and American companies, made a study entitled "Performance Evaluation of Future Organizations". That was the first time that the BSC theory based on "best practice" has been drafted. Its aim was to give the companies a strategic tool for the new century, as it was often a problem that the strategy is not transmitted to operational levels. The BSC is in fact a 'balanced, performance-based, strategic planning and evaluation system'. Balance means that the system strives to create the balance of viewpoints, on the other hand, it also contains objective and easily quantifiable outcome (earnings or profit) indicators, and subjective performance (driver) indicators. It is based on outcome indicators and performance indicators; it translates the strategic goals into concrete indicators.

This is also a planning system, as indicators need to be set target values, actions and a financial budget have to be assigned. It is an evaluation system because it meets - set up to measure - the target value with actual performance. The BSC breaks down the mission and the strategy into specific goals, indicators, and action for processes, organizational units, and even employees.

"The Balanced Scorecard provides an opportunity to show the combined effects of the various measures, and it integrates and focuses on the ongoing development, reorganization and transformation programs." (Norton, Kaplan, 2002.)

**Table 1: Compare of the strategic balanced scorecard and conventional performance indicators**

Traditional indicators	Balanced Scorecard indicators
These indicators measure the full range of company's operations.	They concentrate only on the key strategic areas.
There are not cause and effect relations.	They are linked to a logical chain.
The activities are not always driven by the strategy.	The plan derived always the values from the strategy.
Shorter-term targets are defined.	They formulate longer term expectations.
They do not communicate the strategy.	They communicate the strategy.
The targets and indicators are not assigned to actions.	Targets and indicators are assigned to actions.

Source: Szóka, 2012b.

It can be seen from the table that this strategic tool provides managers with a simpler and more transparent picture of the company's operations than conventional and unilateral performance metrics. In case of other methods, it is a problem that they do not reveal the cause-effect relationships or concentrate on too many goals, or the performance evaluation is too large and intransparent. Traditional financial indicators generally do not provide sufficient information.

One reason for this is that they are past oriented, that is, the events that have happened and the effects of the decisions are examined ex post; and they are for short-term so they do not show the root causes of the problems. Furthermore, they are not suitable for displaying the development of the qualitative factors, the employees' intellectual capital and the organizational learning process (Szóka, 2012b.).

### 3 Viewpoints, indicators and structure

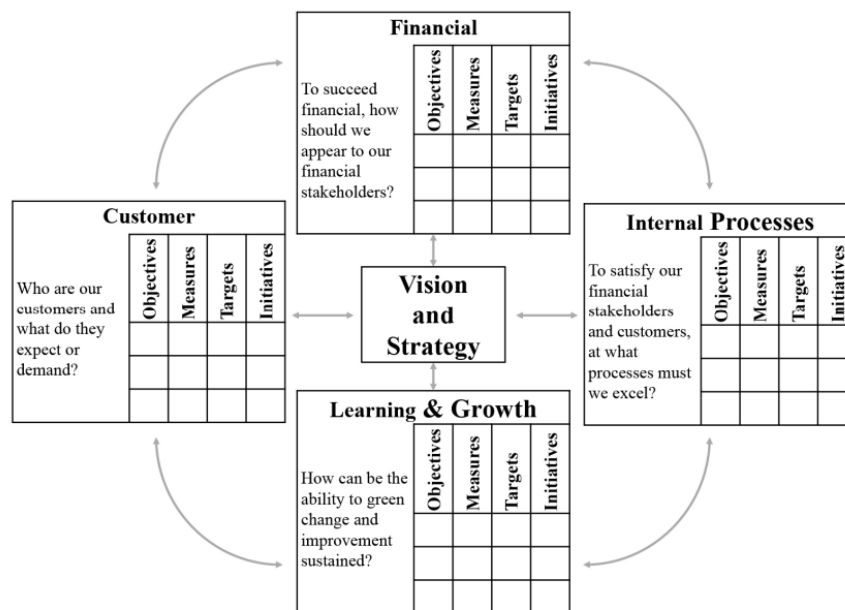
In a classical interpretation BSC consists four coequal viewpoints, the financial, the customer, the internal processes and the aspect of learning and growth and these perspectives are closely related (Kaplan, Norton, 2002.).

In every perspective, we define the strategic goals that can provide for the company a competitive advantage. Strategic goals are derived from mission, core values and vision. In order to investigate their achievement, we set up indicators and we can examine these.

There are two types of variables, the outcome indicators and performance control indicators. The most popular variables, the measurement conditions of which are given, are the outcome indicators. These indicators measure the end result of a previous process but do not provide information on what and when their value so formed. These

result indicators are combined with indicators that show the most influencing factors for future performance which are called performance-oriented indicators. Performance control indicators are really looking at value-creating processes and focusing on intervention possibilities. Performance control indicators focus on longer-term goals. That is, BSC's integrated performance measuring system concludes both outcome indicators and performance control indicators. Then, the target values and expectations are determined in connection with indicators, taking into account the actual value. Finally, we will take the necessary measures and actions to achieve the targets.

**Figure 1: The Balanced Scorecard System (four viewpoints)**



Source: Kaplan, Norton, 1992.

In the figure you we see the four aspects of the classic BSC, each of which is linked to the mission and strategy. Based on mission and strategy, we define specific goals in every perspective. Goals and indicators need to fit together and be consistent with corporate strategy.

It is recommended that 4-5 pointers be assigns per viewpoint, otherwise the system will be too complicated or the indicators will overlap each other. The financial perspective investigate the question of what investors and shareholders are expected when investigating the return on invested capital so it includes the financial objectives and the indicators of the financial result. The financial perspective also takes into account the life cycle of the company. During the growth phase, the increase in sales and turnover is the goal; at the maintenance phase, primary aims the return on capital, full utilization of capacities and increase of ownership value over a given capital; at exit phasethe goal is to reduce the capital requirement rather.

The customer perspective looks at how the organization's actions are judged by the customers. What must we do, to make our customers satisfied? This viewpoint also allows the company to clearly identify and measure the so-called value offer to the

targeted customer and market segment. These product or service features are considered to be the most important outcome indicators and performance control indicators in connections with customers. " (Norton, Kaplan, 2002.)

Such indicators, for example, quality, service flexibility, warranty. In this perspective, they specify on which customer segment has the company concentrate and what benefits it provides for them; respectively what the company is doing better than its competitors. In this dimension, customer satisfaction and quality of customer relationship can be examined i.e. relationships with customers should be integrated into the most important business factors.

In the perspective of internal processes, we determine how the operational processes help the achievement of strategically important goals. Critical and very important processes need to be defined in which the company has to offer very good performance. We have to focus on the processes that are relevant to achieving consumer satisfaction, and thereby the implementation of the strategy. This viewpoint includes both pre-sales and post-sales processes and product support. It is important to have innovative products and services appear, as this greatly contributes to high market share and financial profit growth.

The fourth is the learning and growth perspective, it shows the personal and technical conditions that can serve as the basis for the objectives of the three previous areas. What learning and development goals can be achieved with human resources and the development of the organization. Innovation, continuity of research and development, training of the employees (training within companies), development of the infrastructure and the knowledge base, and the appropriate use of information and communication systems are important. Additionally, employees' satisfaction and motivation have great importance. Well-qualified (long-life learning) and satisfied employees and the appropriate working conditions contribute to productivity growth, which indirectly influences the financial results (Szóka, 2007. 2012.).

Because of the diversity of organizations and the market environment, the BSC is different in every organization, so it can not only include these four viewpoints. A fifth viewpoint or these four viewpoints in another breakdown may be appeared, depending on the factors that are strategically the most important at the given company.

For example, at the public sector may be a viewpoint the performance of public duties and protection the environmental at environmentally conscious companies or the sustainability. The four viewpoints in another breakdown means on the one hand, to change the hierarchical order of viewpoints, on the other hand one viewpoint is can be replaced by another strategically more significant perspectives such as telecommunications organizations, instead of learning and growth the innovation, or the market, or the social responsibility may appear as a viewpoint (Szóka, 2007. 2012.).

#### **4 The cause-and-effect relationship**

In the BSC system, the cause-effect system is very important, i.e., the indicators are not simply listed but based on the strategy but we have to build up a causal system (measures/actions and their results).

So each of the indicators in the BSC is an element of the chain of cause-effect system. When assuming the hypothesis system (if-then) we assume the impact of one or more other indicators (if) to an indicator (then). Graphic representation – visual summary or framework – of the corporate target system is called 'strategic map'. It also includes content-relationship among the targets and their order of importance. It has a given hierarchical order of viewpoints on the strategic map, as it provides the logical structure.

On the one hand, the financial perspective is on the top because financial targets count as the most important elements of corporate success, on the other hand, because it can be seen in this perspective that the strategy whether profitable or not, what the company used. The company may be very good in all the other three areas, but if it does not meet the financial requirements, then the BSC cannot be considered successful.

The second is the customer's dimension as buyers buy the company's products and services so they give the revenue, which provides the basis for financial expectations. The internal viewpoint is the third, as the corporate processes also affect to financial results through customer satisfaction. At the bottom, the perspective of learning and growth can be found, as it provides the basis for the realization of the previous three viewpoints. It is extremely important that based on the strategy, we build the chain of cause-and-effect relationship, and that the targets and the indicators have to cover all the areas.

Small businesses cannot really build and apply a BSC system. The reasons for this is the lack of strategy and/or they do not accomplish it, or they have no resources to run the BSC. The latter may be a problem for medium-sized companies too as evolving (developing), the system, the measurement and the control require significant resources. Often there is not corresponding data, cause-and-effect relationship, the indicators are inadequate, or we faced with internal resistance and these all hinder the implementation. After we have been set up the indicators, in the phase of developing the measuring system which required a long-lasting work, companies may sometimes 'get tired'. This also shows that committed management and appropriate measurement techniques, sufficient resources are needed to develop and operate a good BSC, as well.

## **5 Industry 4.0**

The development of society and the economy always followed each other in parallel, the industry trying to support this development. The successive industrial revolutions have always changed our lives fundamentally, and they had and have social effects.

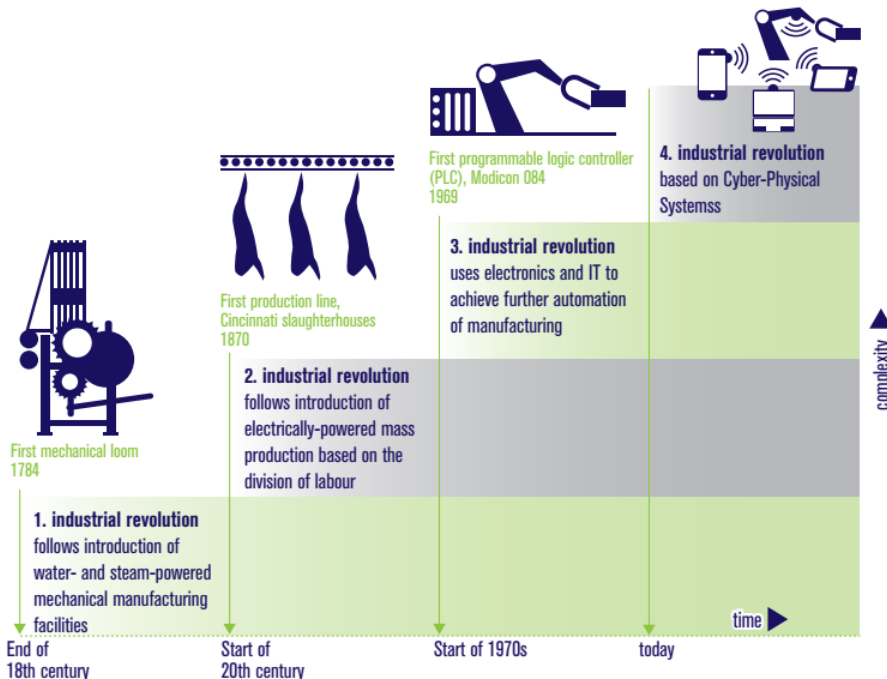
The first industrial revolution – from end of the 18th Century, till first half of the 19th Century – related to the appearance of machines, e.g. mechanical and steam machines, steam engines, vapour locomotives, accelerating traffic and communication.

The second industrial revolution is characterized by the production of run-of-the-mill production and mass production, and the widespread using of electricity. Because of the growing population, production had to be increased with adequate efficiency. The chemical industry, the steel industry and electronics have grown considerably. The

phone and car was appeared, which further accelerated the communication and increased the mobility.

The third industrial revolution started around 1950, information technology became cheaper, computers and automated production started to spread. Industry 4.0 is the latest trend in production and set new standards for smart factories and digitized production. Its goal is to create intelligent and networked production that enables more efficient and personalized production using Cyber-Physical Systems.

**Figure 2: The four stages of the Industrial Revolution**



Source: Kagermann, Wahlster, Helbig, 2013.

The physical production is connected to the digital world, and the part of it the smart factory and manufacturing, the smart products, maintenance, warehouses, etc. Smart robots, predictive analysis will appear; communication realized within software. All this is based on the appearance of digitization, Big Data, Artificial Intelligence and digital services in the production process. During the value chain the production, leader and control devices coordinate and organize themselves and their operations. Human presence and intervention decreases, all processes are complemented by a digital background and services, automation is getting stronger.

Summing up the key features of the Industry's 4.0:

- Interoperability, i.e. machines, devices, sensors and people interact (make contact) and communicate,
- the information is transparent, the systems create a virtual copy of the physical world, a cyber-physical system is developed,
- assistance, the CPS systems are able to support decision-making and solve problems,
- decentralized decision making, CPS can make decisions alone and become autonomous (Marr, 2017.).



Industry 4.0 has three main features in production: horizontal integration through value networks, digital end-to-end integration across the value chain of production, respectively the integration and network manufacturing systems. It is important that the performance management process can only take place in real-time (Wan, Xia, 2017.). Deloitte Consulting AG also lists the effects of rapidly developing techniques as catalysts (Deloitte AG, 2015).

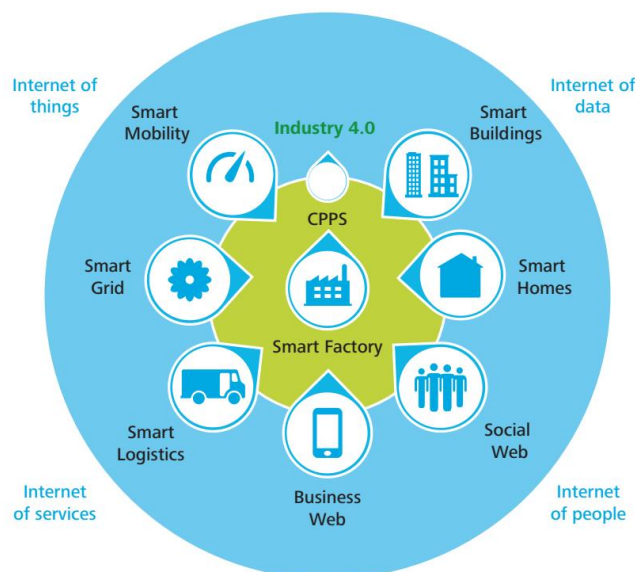
These systems consist of physical, intelligent and networkable components that together form the 'Internet of Things' (IoT). IoT is able to gather, sort and real time synchronize the data from different sources within a factory or business, to which intelligent networks are used. This is realized by using so-called „Cyber-Physical Systems' (CPS). In the CPS physical and cyber systems are closely integrated at all levels. It integrates computing and physical processes, uses embedded computers and networks to communicate and control. Mutual feedback appears between the two subsystems. CPS makes it easier to convert bulk data into real information.

The CPS structure includes all the necessary steps to development a complete and integrated CPS. This CPS structure consists of two components: the advanced connectivity which ensures the real-time data streaming from the physical production to cyber space and the feedbacks, second, the intelligent data analytics.

Let us see the part of CPS structure briefly:

- Intelligent (smart) connection: management and simplification of data collection systems, suitable sensors, data sources and transfer protocols.
- Data-to-information conversion: architecture where data is analysed and converted into valuable knowledge using intelligent algorithms and data mining techniques.
- Cyber space: the whole computer system as a central information centre.
- Cognition: a thorough understanding of the observed system.
- Configuration: feedback from cyber space to physical space, supervisory control (Lee, 2015.).

**Figure 3: The industry 4.0 environment**



Source: Deloitte AG, 2015.

For Industry 4.0 is a key feature the connectivity potential between smart infrastructures (smart mobility, the smart grid, smart logistics and smart homes and buildings). Business networks –B2B or B2C –and social media play an increasingly important role in digital transformation. The new networks and connectivity opportunities offered by Industry 4.0 on 'things, services, data and people on the Internet' means that production is going to change enormously in the future (Deloitte AG, 2015).

These systems must ensure the transmission of fast, secure and large amounts of data. Wireless communication tools (smartphones, tablets, etc.) are helping this (Dream Factory (ICV), 2015).

The smart factory was created at the 'Siemens electronic control unit manufacturing plant' in Amber (Elektronikwerk Amberg) the products control the production itself. Using a product code, they can tell the machines what action they need at that moment. The machines are coordinated with each other which product should be produced with urgency. Independent computer programs monitor the production and ensure the compliance with manufacturing standards and rules (Siemens, 2014.).

In case of failure 'KUKA Robotics LBR iiwa robot' notifies the properly trained mechanic. The system determines the time of maintenance and pre-order the necessary components or prints it using 3D technique (KUKA AG, 2015.).

In this system, predictive analysis can help prevent failures. WINGAS CHP plant (at Lubmin in Germany) it is already planning maintenance, this way (WINGAS, 2016.).

## Big Data

All the companies meet, know, allocate and generate thousands of data. That is too much, so much data is difficult to efficiently process and make it usable. This means a lot of data analysis possibilities and of course tasks. Big Data means that this amount of data is have to be processed and transmitted to be user friendly (comprehensible). Data mining helps to find out the real connections between large amounts of data. It looks for patterns, makes models based on them, draws conclusions and proposes actions. So IT solutions need to be provided to managers and controllers that can reduce the complexity of information and are able to put them in an appropriate context and help to make quick decisions. When an important decision has to be made, we are faced with three issues. We need to clarify, where did the data come from, what kinds of analyses were conducted in connection with this and how confident are we in the results. The other issue is that the data can be overridden if needed? (McAfee, Brynjolfsson, 2012.). Automation can be used for client management and for typeable financial transactions. Where standardized – similar, numerous – processes are taking place, automated management of large-scale processes (e.g. HR, IT, financial and operational areas, especially in shared service centres) can also be implemented. It is helped by Artificial Intelligence and learning software, but this cannot be fully automated for example, e-mails written by clients are not the same. (Ostrowicz, 2017.)

## 6 BSC's new approach and changing in contents

Over the past 25 years, the BSC has been continuously developing, it has gone through several major changes since it has to meet the new challenges. It is becoming more sophisticated and more accurate, supporting the strategy is more and more effectively. Now the companies use the third generation BSC, let's briefly survey this. The first generation BSC has opened a new dimension in supporting the strategy by combining financial and non-financial performance indicators.

The second generation BSC has released a strategic map which is linking the strategic targets and processes to help identify the activities and results that need to be measured.

The third-generation BSC includes a set of targets (target-statements, missions) as an initial step too; which is accompanied by the necessary measures and it assigns a budget for implementation the targets.

Key elements: determining indicators and targets, creating a strategic map, determining the connectivity of indicators, and continuously measuring, monitoring them.

We start actions to achieve the targets and sometimes we examine the status of achievement.

Benefits of 3rd generation BSC:

- it contains really important outcome indicators and performance indicators,
- strategic groupings can be applied: vertically between organizational units and horizontally between the same level of organizational units. This applies also between employee targets and organizational targets.
- the BSC will be valid for a long time,
- we can build a consensus-based team,
- it can be developed faster than the previous BSCs
- it can really be used for targeting,
- identifies the relationship between the goal to be achieved and the activity required to achieve it,
- develops the management's knowledge and attitude towards the implementation of the strategy,
- it better communicates the strategy within the organization (Szóka, 2007. 2012.).

Today, 63% of companies using BSC apply this third-generation version (2CG Active Management, 2017.).

## 7 The BSC at Industry 4.0

In the case of companies introducing the tools and opportunities for Industry 4.0, the BSC needs to be modified. Due to the characteristics of Industry 4.0, other indicators can and have to be considered, as the business model is structured differently. This does not mean that the habitual indicators must be replaced one by one, but some of them need to be changed or placed in another context.

The switchover to digital systems and their continuous operation (increasing the numbers of the applications and users) causes high or higher costs. Therefore, the cost

structures of digital business models differ from the cost structures of classical business models and we need to modify the cost accounting systems. Instead of cost-based cost estimates, the value of a digital product's benefit to a customer should be calculated and used as the basis for calculating the price. The economic profitability of the new business model is less dependent on the cost side of the products and the market price (margin), but rather from the scalability of the business model (Dream Factory (ICV), 2015).

Scalability means that the company counts on the growth potential, flexibly and dynamically knows and wants to follow it. The new business model makes it possible the company will remain operable even in expanding operations. Industry 4.0 is inherent with the high product and process variation of flexible production that complicates the cost control. Instead of one-dimensional decision-making procedures (optimized capacity utilization at fixed costs), multidimensional decision-making procedures are used. This means that the starting position and variables are unclear and difficult to quantify, so it is not always possible to make an obvious decision, it needs to be taken the customer's behaviour and the market reactions. Thus, same products and processes sometimes have a different cost (Reischauer, Schober, 2015.).

## Viewpoints and indicators

### The financial viewpoint

Of course, in this perspective the very important indicators, indexes are the revenue and its growth, the profitability, the cost of capital, the margins, the cash flow or length of the cash conversion cycle. The company develops in vain dynamically or switch to the digital business model, if the owners are not satisfied, if the revenue, the profit, the return or cash flow is inappropriate. However, Industry 4.0 requires investment, analysis return of innovation (NPV, IRR, payback time etc.) is important too. During the strategic planning phase, it is necessary to examine how the margin of the products level is which are generated the result of R & D & I. It is also necessary to examine how the R & D & I costs compare to revenue of the new, developed products.

As mentioned above, the cost levels are not constant, so instead of the cost per revenue, we have to compare it to the value of an order or customer. Financing is an important factor in scalability. The question is, due to the possible lack of financial scarcity what kind of financial sacrifice can or want to the company make since the financing has costs.

### The customer viewpoint

In this perspective, we need to describe how customers perceive the company what image they get about the company. Customer value is an important indicator, of course to determine this we have to take into account the costs. Allocation the costs in Industry 4.0 processes is based on a customer focused manufacturing processes.

Its main elements are the totally focus on the customers and the modularity of manufacturing. The cost level depends on which modules are used in producing and what additional services need to be taken into account. We must constantly communicate with customers and we have to demonstrate our new information and communication technologies.

We have to analyze what kind of benefits can we generate for customers through smart manufacturing and smart products (function + quality + time + price) and how can we improve the common advantage with additional intelligent services.

Always important indicators – and it remains – are the number and proportion of new, retained and returning customers, the value of a new customer (sales revenue, margin) and the customer satisfaction (number of complaints). Reliable and high-value products deliver satisfied customers and thus the higher sales revenue (or market share) improves the indicators of the financial perspective. Customers' relationship has now entered a higher level, so it needs to be integrated into the most important business factors, next to the value of image and brand.

#### Internal Processes viewpoint

Summarized in two sentences, this perspective shows what kind of process the company is –or should –doing very well. What are the process-based factors that make for business competitive advantage? In Industry 4.0, therefore, the physical world (production, provision of services) is linked to the digital world.

This is an excellent example for this: in case of a machine failure it signals the necessary component and task, then sends it to the maintenance and the machine meanwhile. When the maintenance period is near, it gives a signal for the responsible specialist on time; it happens all on cyber-physical base.

Due to the high degree of automation, production time is reduced, the profit will be higher; the response time decreases, and this will all benefit for customers and owners. Processes based on Industry 4.0 technologies generate value for customers during production and provision the services. The value is created by linking the input of different sub processes into network modules. This means that because they are in a network, we always use the module that is needed and that does not cause any difficulty.

The question is whether we can build this network or not. The Industry 4.0 is a processes, the combination of primary and support processes –during the value chain – which is different from the previous approaches to manufacturing control due to network modules. Depending on customer requirements, different primary and support processes are appeared, it will not be the same for all customers. The customer modules must be 'smoothly' complied and it can be examined whether this has indeed succeeded.

In a case of a problem, the response time is hopefully short, which is an important indicator, it is directly linked to customer satisfaction. Therefore, operational production control and ongoing cost control of the processes become even more relevant. The biggest challenge is collecting and checking the appropriate cost information at the

place of creating the value. Subsequently, the costs will be summed up in customer-specific modules and analysed (see Customer Value) (Reischauer, Schober, 2015.). However, it is not only the costs that need to be analysed, but also the background of these, the causes.

We have already mentioned the importance of innovation and the transition to Industry 4.0 requires innovation investments. The R & D & I capability, its lead time and its effectiveness –i.e. the quality of these –is still important. The direction is now the smart factory, production, products, so we focus on this. Let's look at the R & D & I and the transitions' costs, but not the revenue, but not on sales but on the customers' value (the value of the modules). Of course, other indicators can be created, but these should be observed during the transition.

### The Learning and Growth viewpoint

Using the Industry 4.0 technologies, during introduction of smart manufacturing it is perhaps one of the most important viewpoints. This gives the safe basis for the other three perspectives. Intelligent factories are complex, dynamic and flexible systems and these require those employees who understand and use the new technologies to operate them. That is, other types of labour are needed than before. The labour for smart manufacturing is professionally trained in IT, understands and uses the smart devices. In order to operate, to cost and value calculations require real-time data collection. The question is, that the role of information potential in the development, planning, performance management and monitoring (Szóka, 2018.).

We can also call it the new type of manpower is the digital labour who shares the knowledge and experience of others. In addition, it is capable of collective learning, all within an organized framework, the background of this must be provided by the company. This requires a well-functioning information and communication system, in-service training, which is costly. This cost should be linked to innovative, smart products, that is to say, compare to these.

Traditional indicators also play an important role. In my opinion, in this industry, because of the skilled labour –stratigraphic focus! –the motivation and satisfaction of employees is particularly important. All this is necessary on the one hand to ensure the employees make the best decisions and, on the other hand, to serve the customers to their best knowledge, always provide accurate information.

## **8 Strategic map for companies transition to Industry 4.0**

Appropriately selected indicators are shown on a strategic map that shows the relationships. Indicators must be linked so that there is a cause-and-effect relationship between them. To avoid over-complexity, the system and the indicators –their change and impact –can be measured it is recommended 4-5 maybe 6 indicators per viewpoint.

## Applicable indicators

### The Learning and Growth viewpoint

Appropriately skilled labour, level of qualification (IT, smart devices) - L1

Quality of innovation potential (throughout the company) - L2

Well-functioning information and communication system (e.g. real-time data collection)  
- L3

Motivation and satisfaction of employees (loyalty, fluctuation rate) - L4

Knowledge and experience sharing, collective learning, education (their existence and cost compared to new innovative, smart products) - L5

### Internal Processes viewpoint

Success and lead-time of R & D & I (focusing on smart manufacturing, products and devices) - I1

Level of automation (predictive forecasting machines and systems, response time and modification time) - I2

Cost allocation (per module, per customer) - I3

Real time production and process control (quality, time) - I4

Shaping of customer-tailored products and modules and their flexible interconnection possibilities (networking level) - I5

### The customer viewpoint

Brand, image (as a digital company) - C1

Level and quality of customer relations (communication, presentation of new technologies) - C2

Customer Satisfaction (number of complaints) - C3

Number and proportion of new and loyal customers - C4

Customer Value (the value or margin of modules and purchases) - C5

### The financial viewpoint

Gross profit margin (of the new, developed products) - F1

Profitability level (ROI, EVA) - F2

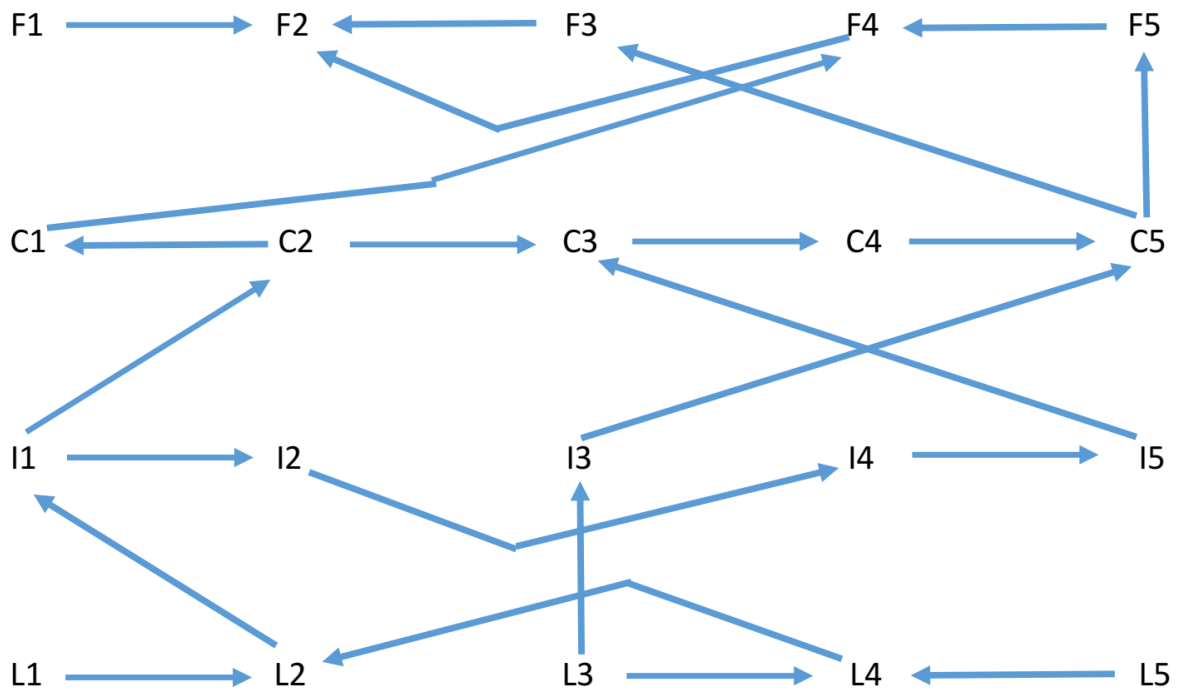
Sales revenue and its growth - F3

Financial aspects of financing and investment (transition costs, financing of this, investment economic indicators) - F4

Adequate cash flow - F5

The following figure shows a possible system that contains the factors of Industry 4.0 based on the foregoing.

**Figure 4: Strategic map for Industry 4.0**



Source: Own figure

If the company has appropriately skilled and motivated labour, it improves the opportunities for innovation and its quality. A well-functioning information and communication system, the knowledge sharing, the trainings enhance the motivation and satisfaction. The employee feels important oneself, receives the necessary data, sees the meaning of his work.

The company invests in human resources, there are trainings, it also provides accurate data for cost allocation. If the innovation potential is good and exploited, we can implement successful R & D & I projects. Through the projects we can build modern, automated systems that increase the level of customer relations, we can show new technologies and this is appreciated by the buyers. Satisfied employees work well and quickly, and manage the modules well, which, of course, also increases the customer satisfaction. This will result in more and more returning customers who buy more. This increases revenue and cash flow, which we can use for financing the investments.

A good brand or image is a better representation of the company, which can help the financing possibilities. If the revenues are increasing and these investments are paying off, they will improve the profitability and the value of the company.

## Conclusion

Looking around the world, we can see that companies have already started implementing Industry 4.0 solutions. The examples range from visualized real-time productivity to mobile support systems that map the errors and malfunctions. Digital



transition is a great opportunity, but also a great investment and risk. As a first step, the owners and the management must commit themselves to the transition and start the necessary investments. Digital production is fundamentally different from the previous ones, all happens using internet platforms, the machines and products communicate with each other. The key is to exploit the opportunities and increase our competitive advantage using Industry 4.0 technologies.

The strategy will also be affected, and its implementation will be a more important issue. The Balanced Scorecard strategic support tool may even have to be used at Industry 4.0. It is suitable for presenting the relationship between important indicators and measuring them to evaluate the strategy and its implementation. Changing and modifying the indicators, we introduced the important elements of digital systems into the BSC without neglecting the traditional focuses. Through the strategic map, we have delineated a modified strategy evaluation model that can take into account the concept of the new business model.

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