The Organizational Life Cycle: Review and Future Agenda

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ABSTRACT

Purpose: The review summarizes major research that contributed to the organizational life cycle theory, discusses major issues and contradictions of the theory and offers additional assumptions about the organizational life cycle. Based on that, it attempts to offer a future research agenda for the theory.

Methodology/Approach: The paper uses narrative review; the list of included life cycle models stems from previous summaries of the theory and subsequent snowball search through reference lists of individual reviewed papers.

Findings: The theory is rich with various life cycle models that nevertheless converge on some major characteristics. Organizational life cycle can be described with classical five stages: (i) founding, (ii) growth, (iii) maturity, (iv) decline, and (v) revival. However, the stages do not necessarily follow in such an order, and therefore the research establishes likely paths in their development. Also, it appears that growth rate (relative to a market) and change in formalism are major factors distinguishing in the theory individual stages.

Research Limitation/implication: Organizational life cycle theory is often neglected based on simplifying presumptions like determinism of organizational development. On the other hand, there is a growing evidence that factors stemming from particular life cycle stages alter organizational behavior and therefore should be considered in behavioral research on an organizational level.

Originality/Value of paper: The paper represents up to date review of major theoretical models from the perspective of the current state of the field. Since the theory flourished in 70's and 80's it is inevitably limited in some aspects. The new review may spark renewed interest in implications stemming from the theory and enrich analytical tools of management scholars.

Category: Literature review

Keywords: organizations; life cycle; review

1 INTRODUCTION

Organizations change over time, not just in terms of their strategies, but also in their leadership, structure, innovativeness and many other areas. Most of these changes are subtle from the perspective of the overall life – the existence of the organization. However, some are part of distinguishable patterns that form individual stages of organizational life cycle. Similar to living organisms, organizations have also life cycles that are determined by their founding and eventual demise (or take-over). Although not preset from their birth, most organizations meet their end in the range of decades. For example, out of the twelve companies that constituted Dow Johns Industrial Average Index in 1896, only one – General Electric – still belongs to important U.S. companies and it is hard to consider it thriving. The rest at best lost their dominance, changed their main business areas, were broken by antitrust laws, or were frequently bought by other companies. Virtually any organization existing for several decades will go through a revival stage, be taken-over or merge, or demise.

Although demises of large organizations usually represent spectacular accounts of disintegrating competitive advantage, their founding and growth tell totally different stories. On the other hand, not many organizations reach maturity (Dodge and Robbins (1992) note several indications of this), often not meeting break-even point or being taken-over. Maturity itself can be represented by a huge variety of different forms in terms of organizational size, age, and many other dimensions.

Individual life cycle stages are characteristic by different issues faced by the organization, the fact that is important for organizational life cycle scholars (e.g., Lippitt and Schmidt, 1967) and represents the major contribution of the theory together with patterns of solutions usually adopted by organizations facing them. Nevertheless, the organizational life cycle is from its outset (Downs, 1967) a subject for substantive controversy. Its name alone can draw a picture that is helpful both for theorizing (by the use of analogies with life cycles of biological organisms) and criticism (by apparent differences between organizations and biological organisms).

Despite their presentation as a series of stages, organizational life cycle should not be considered strictly sequential and deterministic (in which we agree with e. g., Miller and Friesen, 1984; and Mintzberg, 1984). This misconception, shared not just by critiques but also a number of the literature's authors, may be one of the major reasons why organizational life cycle theory failed from favor in last decades, in stark contract to e.g., product life cycle assessment (Hellweg and Canals, 2014). Compared to products that are often replaced by their successors, organizations may go through several revival stages and their life span is relatively longer than life of their products.

The theory itself is characteristic for the wealth of differing theoretical concepts rather than consensus understanding of the organization's life stages (Dufour, Steane and Corriveau, 2018). We overview the major frameworks further in our

work. Despite this fact, we argue that the literature contains a large share of similarity that we attempt to highlight later on in our work.

We believe that organizational life cycle theory may be helpful for numerous organizational researchers since organizations in different life cycle stages behave differently in e.g., capital structure decisions (La Rocca, La Rocca and Cariola, 2011) or market selection and its effects (Bellone et al., 2008). Acknowledging these differences across life cycle stages may, therefore, bring new insights into various research topics.

2 ORGANIZATIONAL LIFE CYCLE REVIEW

We conducted a standard literature review starting with the studies listed in reviews of Quinn and Cameron (1983) and Dufour, Steane and Corriveau (2018). Then using the snowball method we added several other studies that are cited in the papers we review. In the process, we focus on individual life cycle stages and their main characteristics as described by the authors. We summarize our findings in Table 1. It is important to note that the life cycle models presented in the table are not independent of each other. There was a rich cross-fertilization among authors (e.g., Jawahar and McLaughlin, 2001) that may be the cause of some convergence in later years.

Although the apparent difference between individual models lies in the number of stages, there are more subtle differences we highlight in the text below. Some models focus on growth part of the cycle only and end up with maturity (these are usually early ones, e.g., Downs 1967; Lippitt and Schmidt, 1967; or Scott, 1971). We base our review on the seminal classification of Miller and Friesen (1984) that distinguish five stages of organizational life cycle: (i) birth; (ii) growth; (iii) maturity; (iv) revival; and (v) decline.

2.1 Birth – Founding

Birth or founding stage of organizational life cycle is characteristic by the organizational struggle for survival (e.g., Lippitt and Schmidt, 1967; Churchill and Lewis, 1983) mediated by product development and acquisition of necessary resources (Jawahar and McLaughlin, 2001). Typically, the organization generates negative cash during these times (Scott and Bruce, 1983). At this stage, the organization does not have any power over its external environment and therefore needs to adapt to it (Lyden, 1975). The structure of the organization is simple, often informal and with centralized leadership (e.g., Smith, Mitchell and Summer, 1985; Gray and Ariss, 1985). In the relationship to stakeholders (Jawahar and McLaughlin, 2001), the organization proactively manages these with shareholders, creditors and customers, accommodates to employees and suppliers, while being reactive or defensive in relationships to the other groups.

While this initial stage is a part of models of all the reviewed authors, some devote more attention to it and paint a more fine-grained picture of what happens

during, or even before, the founding of the organization. The most typical case is Torbert (1984) whose first four stages can be classified into founding – fantasies, investments, determinations, and experiments. While this level of detail may be beneficial for a study of organizational founding, they offer possibly a too rich picture, especially in contrast to later stages.

2.2 Growth

When the organization succeeds in creating its distinctive competitive advantage, growth in sales and market share follows (e.g., Kazanjian, 1988). Now, the focus switches to managing relatively rapid expansion (Scott and Bruce, 1987), with production and resources issues at the forefront (Flamholtz, 1990; 1995). As we discuss later on, cash generation can be either still negative or reach break-even and be positive, depending on other factors. As the demand typically exceeds supply, the organization is rather inward oriented to its production and proactively approaches creditors, employees, suppliers, and trade associations (Jawahar and McLaughlin, 2001). The structure and processes are gradually becoming formal with the organization adapting U-form structure (e.g., Gaibraith, 1982). Despite increasing decentralization and delegation (Greiner, 1972), the company usually keeps entrepreneurial spirit at this time (Adizes, 1979).

Similar to the founding stage, some authors also distinguish several growth stages. This time, we consider them much more helpful since growth pattern of organizations may differ and some of them may not reach that "rapid" growth as envisioned in the classical life cycle model of Downs (1967) and some other authors later (e.g., Smith, Mitchell and Summer, 1985; Hanks, 1990).

Early growth stage (Scott and Bruce, 1987) follows the transition from individualistic to more administrative entrepreneurial style. Typically, the organization either continues with negative cash generation or archives break-even. A simple structure is already in place.

Late growth stage (Adizes, 1979) is characteristic by the struggle between further grow and the need for formalization of increasingly complex processes. At this time, more systematic management is needed, which interferes with a previously unbounded growth orientation. Also, increasing competitive pressures may slow down further development (Dodge and Robbins, 1992). With slowing growth and more formalized nature, the organization stabilizes and matures.

2.3 Maturity

The organization that achieves maturity is stabilized in terms of the need for radical changes. It usually grows foreseeably (Adizes, 1979) and at market rate (Kazanjian, 1988). The organization now lives on past successes, keeps it direction and focuses on exploitation (Dufour, Steane and Corriveau, 2018). At this time, the structure and processes are formalized as management is separated

from ownership (Churchill and Lewis, 1983; Miller and Friesen, 1984) – which, however, may not be the case of small- and medium-sized organizations. Scott and Bruce (1987) point to the adoption of M-form by some organizations, while other authors (Miller and Friesen, 1984; Hanks, 1990; Hanks et al., 1994) link this form to revival stage. However, similar to the separation of management of ownership, this question is more typical for large organizations. At this stage, the organization should be at its temporal profit peak (Scott and Bruce, 1987).

In this case, authors describe arguably the broadest array of individual maturity forms, typically in relationship to the topic they want to cover over the life cycle (e.g., the growth of bureaucracy as Adizes, 1979). In these cases, mature stages are ordered from an ending growth to start of a decline and are characteristic by decreasing innovativeness of the organization (its ability to renew itself) and increasing formalization turning the organization into the bureaucracy full of political struggles (Mintzberg, 1984). With the competitive advantage that starts to slowly erode, the organization enters either revival stage in which it reinvents its business or decline stage in which it struggles with the need for a change.

2.4 Revival

Revival stage represents a renewed focus of the organization on exploration of new possibilities. In this case, adoption of M-form (Miller and Friesen, 1984; Hanks, 1990; Hanks et al., 1994) may happen as the organization keeps both its old and new business lines separated from each other. The co-existence of both businesses is virtually necessary for all except small organizations unless they want to go through the drastic cut into their stakeholders' ties. Also, new resources are brought to the organization, represented by people skilled in R&D, engineering, planning or performance analysis (Miller and Friesen, 1984) to help the revival to happen.

More risk-taking happens at this stage (Jawahar and McLaughlin, 2001), although not blind, but rather informed and analytical (Miller and Friesen, 1984). Of course, there is opposition to a change by those negatively affected by it (Gray and Ariss, 1985), but this does not prevail unless the organization enters the decline stage. The organization that successfully goes through revival stage experience further growth or become stabilized in mature stage once more.

2.5 Decline and Demise

Growing adversity of external environment is a common reason for the organization to enter decline stage (Miller and Friesen, 1984), together with growing internal rigidity or even strife resulting with overall bureaucracy (Adizes, 1979). Attempts to change as strongly opposed (Gray and Ariss, 1985) or are not successful. The focus shifts again to survival (Hanks, 1990; Hanks et al., 1994). The competitive advantage of the organization erodes resulting in decreasing sales (Hanks, 1990; Hanks et al., 1994) and loss of market position (Lester, Parnell and Carraher, 2003). The organization can be caught in a vicious

cycle of insufficient resources making necessary investment impossible which result in the lower appeal of its products and a further decrease in resources (Miller and Friesen, 1984).

Despite the fact that the decline stage is usually the last one in organizational life cycle models, we do not consider it to be necessarily the last in the life of the organization. From our perspective, the decline may end up either negatively for the future organizational existence when it leads to the demise or the loss of independence or it may turn into successful revival.

2.6 Life cycle Irregularities

Although life cycle may describe the general development of the organization and revival stage may explain why some organizations return to growth after achieving maturity or even decline, there are still numerous and frequent cases when organizations follow different paths. The two cases we want to discuss further are: (i) timing of break-even and (ii) timing of decline and demise.

Timing of break-even. Boundary state that is characteristic by break-even, is by some authors assumed to follow founding stage (e.g., Scott and Bruce, 1987; Churchill and Lewis, 1983), while others consider rather as a result of the decision to slow down the growth (e.g., Adizes, 1979). Both cases are possible in the reality, the first often common in traditional and stable sectors, where the organization must relatively quickly prove its profitability to obtain further resources for scalability and growth; the second is frequent in rapidly evolving high-risk sectors, where huge gains can be made by growing quickly (digital technologies). Therefore, we believe that timing of break-even is contingent to the environment of the organization, which likely interferes with the life cycle of environment-industry itself (which apparently affects organizational behavior, e.g., Verreynne and Meyer, 2010).

Timing of decline and demise. Taken as sequential, life cycle models (see Tab. 1) predicts that organizational demise follows the decline of mature organizations. However, as, e.g., Mintzberg (1984) points out, demise is frequent among new organizations as well. He highlights the importance of a leader and reliance of coordination mechanisms on her/him. Any absence may thus lead to disintegration and demise. Another major reason of demise stems from an inability of the organization to generate resources to sustain its operation (in case of financial resources resulting to bankruptcy, take-over etc.).

One of the works that also focus on decline and demise of organizations in their earlier stages is Adizes (1979) who lists reasons for demise in all of his stages: (i) aborted idea; (ii) infant mortality – resulting from fragility of the organization in face of major mistakes; (iii) founder's trap – when founder is not willing to depersonalize organization; (iv) divorce – founding partner or group of people decide to leave the organization; and (v) growing formalism and inner orientation.

Table 1 – Overview of Reviewed Organizational Life Cycle Studies

Authors	**Stages of life cycle**				
Downs (1967)	1. Struggle for autonomy (effort to break through, gain resources and independence)	2. Rapid growth (emphasis on innovation and expansion)	3. Deceleration (coordination issues due to size and complexity, formalization, conservatism)		
Lippitt and Schmidt (1967)	1. Birth (goal to survive, risk issues are discussed, one leader)	2. Youth (goal to stabilize, systematic control and collective decision making)	3. Maturity (adaptability focus, search for new opportunities)		
Scott (1971)	1. Stage 1 (one leader, informal structure)	2. Stage 2 (formalized U-form structure)	3. Stage 3 (search for new opportunities, diversification, formalized M-form structure)		
Greiner (1972)	1. Phase 1 (goal to produce and sell, informal structure, maximal founders' commitment)	2. Phase 2 (focus on efficiency, centralized U-form structure, IT systems implementation)	3. Phase 3 (focus on growth on the market and market extension, decentralization of structure, delegation)	4. Phase 4 (consolidation, creation of product teams, high level of formalization and control)	5. Phase 5 (focus on problem solutions and innovations, matrix structure, simplification of control systems)
Torbert (1974)	1. Fantasies (formation of individual visions, informal communication)	2. Investments (full commitment to form an organization, first relationships)	3. Determinations (goal clarification, creation of both formal and informal contracts)	4. Experiments (testing alternative legal, administrative, production, planning and other structures)	5. Predefined productivity (focus on predefined goals, sustainability of a product as a success measure, forming of standards)
	6. Openly chosen structure (long-term orientation, horizontal differentiation, cooperation across levels, innovative methods)	7. Foundational community (focus on shared values, increasing importance of organizational culture)	8. Liberating disciplines (removal of boundaries between an organization and a market, search for new opportunities)		

Authors	Stages of life cycle				
Lyden (1975)	1. First stage (focus on adaptation to an external environment)	2. Second stage (focus on an acquisition of necessary resources)	3. Third stage (focus on goal attainment)	4. Fourth stage (focus on institutionalization)	
Katz and Kahn (1978)	1. Primitive system stage (cooperation based on shared goals and expectations)	2. Stable organization stage (coordination and formalization)	3. Elaborative supportive structures stage (improvement and creation of systems)		
Adizes (1979)	1. Courtship (formation of intentions of future founders)	2. Infant organization (creation of an organization, no systematic management, one leader, high uncertainty, goal to acquire resources and survive)	3. The go-go stage (fast growth, partial delegation of leader's power, gradual formalization)	4. Adolescent organization (need of further formalization and systematic management, conflict between formalization/stabilization and growth orientation)	5. Prime organization (stable and foreseeable growth, overall stabilization)
	6. Mature organization (standardized processes, focus on performance, decreasing innovativeness and adaptability, routine behavior)	7. Aristocracy (lack of innovativeness, life on past success, growth by price increases)	8. Early bureaucracy (price increase no longer working, search for causes of problems and internal struggles, further decrease)	9. Bureaucracy (growth in formalization instead of innovation, focus on norms and rules)	10. Death (nonfunctional organization cease to exist)
Kimberly (1979)	1. First stage (acquisition of resources, creation of ideology)	2. Second stage (acquisition of sufficient support, employee acquisition)	3. Third stage (identity formation, shared spirit, strong commitment)	4. Fourth stage (formalized structure, adoption of rules, conservative approach, stabilization of external relationships)	

Authors	Stages of life cycle				
Gaibraith (1982)	1. Proof of principle prototype (goal in product development, nonbureaucratic climate, informal processes and structure)	2. Model shop (goal in production, nonbureaucratic climate, informal processes, functions and hierarchy begin)	3. Start-up volume production (goal in mass production, formal processes, U-form, centralized division of labor)	4. Natural growth (goal in profitability, formal control, U-form, decentralized)	5. Strategic maneuvering (goal in dominating a niche, plans and profit centers, matrix structure)
Churchill and Lewis (1983)	1. Existence (one leader, focus on survival, minimal formalization)	2. Survival (simple structure, focus on break-even or at least survival)	3. Success (separation of ownership and management, good economic conditions, question whether grow or stabilize)	4. Take-off (decentralization, high level of strategic and operational planning, systematic control)	5. Resource maturity (decentralization, high level of strategic and operational planning, synergies and resource availability, risk of stagnation and low innovativeness)
Quinn and Cameron (1983)	1. Entrepreneurial stage (abundancy of ideas, minimal planning and coordination, niche occupation)	2. Collectivity stage (informal communication and structure, collective decision making, innovativeness and commitment)	3. Formalization and control stage (formalization of rules, structure stabilization, performance focus)	4. Elaboration of structure stage (decentralization, adaptability focus, expansion)	
Scott and Bruce (1987)	1. Inception (entrepreneurial individualistic style, no structure, negative cash generation, focus on market and product)	2. Survival (entrepreneurial administrative style, simple organization structure, negative/break-even cash generation, focus on revenues and expenses)	3. Growth (entrepreneurial coordinative style, centralized U-shape form, positive but reinvested cash generation, focus on managed growth and ensuring resources)	4. Expansion (professional administrative style, decentralized U-shape form, cash generation positive with small dividend, focus on financing growth and maintaining control)	5. Maturity (watchdog management style, decentralized U-/M-shape form, cash generation with higher dividend, focus on productivity and expense control)

Authors	Stages of life cycle				
Mintzberg (1984)	1. Formation (autocracy politics - personalized internal coalition and passive external coalition, strong leader position)	2. Development (either (i) instrument politics - bureaucratic control though management, or (ii) missionary politics - institutionalized ideology)	3. Maturity (either (i) closed system politics - a group of administrators as a center of power, or (ii) meritocracy politics - power based on skills and knowledge)	4. Decline (politicized organization)	
Miller and Friesen (1984)	1. Birth (simple structure, one leader, minimal formalization)	2. Growth (more complex structure, U-form structure, some formalization, focus on growth and diversification)	3. Maturity (conservatism, focus on performance and profitability, separation of ownership and management, systematic control and planning, centralization)	4. Revival (diversification, innovativeness, M-form structure, centralized strategy, decentralized operational decision making)	5. Decline (centralized decision making, conservatism and risk aversion, focus on internal problems)
Smith, Mitchell and Summer (1985)	1. Inception (informal structure and communication, limited and nonsystematic planning, ad hoc decision making, continuous evolution)	2. High growth (formalization and centralization, budget planning, analytical decision making, rapid growth)	3. Maturity (formalization and centralization, strategic planning, rules, growth slows down or turns to decrease)		
Gray and Ariss (1985)	1. Birth and early growth (little or no formal structure, one leader, uncertainty in the market, focus on internal adaptation)	2. Maturity (delegation to management, bureaucracy, focus on market share, manage external environment, formalization of rules, conflicts between subunits)	3. Decline or redevelopment (hostile environment, high incentives to change and opposition against change, intensive politics)		

Authors	Stages of life cycle				
Kazanjian (1988)	1. Conception and development (non-existing structure and minimal formalization, goal to transform idea into reality, focus on product development)	2. Commercialization (structure formation, U-form structure, goal to market a functioning product)	3. Growth (further development of structure, focus on large scale manufacturing/selling/distribution, growth of sales and market share)	4. Stability (formalized structure, norms, focus on preserving a good market position, growth at market pace, separation of ownership and management)	
Hanks (1990), Hanks et al. (1994)	1. Start-up stage (simple structure, centralization)	2. Expansion (fast growth, growth in capacity, incremental innovations, U-form structure)	3. Consolidation (slower growth, systematic control and planning, focus on performance and profit, process innovation, participative leadership)	4. Revival/Diversification (fast growth, diversification, M-form structure, decentralization and formalization)	5. Decline (decreasing sales, focus on demise avoidance, need for leaders and reorganization with focus on decrease in bureaucracy)
Flamholtz (1990; 1995)	1. New venture (defining market and developing product, focus on survival) 6. Integration (integration of various units, while keeping benefits of partial decentralization)	2. Expansion (focus on operational system and organizational resources) 7. Decline-revitalization (focus on organizational renewal)	3. Professionalization (development of management systems)	4. Consolidation (focus on organizational culture)	5. Diversification (search for new markets and products, re-introduction of entrepreneurial spirit)
Dodge and Robbins (1992)	1. Formation (goal to transform idea into reality, one leader, selective strategy)	2. Early growth (remarkable growth, uncertain environment - need for adaptation, gradual formalization of a structure)	3. Later growth (slowing growth, competitive pressures, question whether growth or stabilize, advance in systematic control and planning)	4. Stability (stability or stagnation, bureaucracy, demise or renewal in innovativeness)	

Authors	Stages of life cycle				
Jawahar and McLaughlin (2001)	1. Start-up (focus on development and implementation of business plan, proactive shareholders, creditors and customers focus, resource acquisition, entering market, failure as reference point - risk-seeking)	2. Emerging growth (risk aversion, focus especially on creditors, employees, suppliers and trade associations)	3. Mature (risk-aversion, overconfidence of success, proactive stakeholder management - except for creditors)	4. Decline/Transition (risk-seeking, proactive management of shareholders, creditors and customers)	
Lester, Parnell and Carraher (2003)	1. Existence (focus on survival, centralization)	2. Survival (focus on growth attainment, gradual formalization)	3. Success (high level of formalization and bureaucracy, delegation)	4. Renewal (goal to achieve leaner organization, support of innovativeness, possibly matrix structure, decentralization)	5. Decline (loss of market position, decision making centralized again)
Dufour, Steane and Corriveau (2018)	1. Acting the future (entrepreneurial spirit, innovativeness, gap between vision for the future and current state)	2. Reflecting on the past (development of rules for success while trying to remain entrepreneurial, performance focus)	3. Acting on the past (keeping direction without sudden changes, exploitation focus)	4. Thinking the future (reflection of current position and thinking about a future one)	

3 LIFE CYCLE MODEL

One of the major setbacks of organizational life cycle theory is its focus on large organizations. Although birth-founding and growth stages are experienced by almost every successful mature organization, nature of growth much affects resulting maturity. Mature organizations do not necessarily be big in size and that influences numerous characteristics ascribed by the authors to mature organizations. For example, separation of ownership and management (as assumed by Churchill and Lewis, 1983; Miller and Friesen, 1984) is frequently not the case for some SMEs or family firms (Brunninge, Nordqvist and Wiklund, 2007; Burkart, Panunzi and Shleifer, 2003). Despite the fact that the reviewed models exhibit rather growing complexity over time, we believe that this issue has to be addressed when working with life cycle models in a subsequent research (beside above-mentioned separation, it is arguably also formalization, structure, size etc.).

In this section, we want to present a model that synthesizes previous literature. We do not aim to bring an entirely new view of the life cycle since we believe that the literature already depicted a picture that corresponds to the abstracted reality. Instead, we want to fill in our answers to major reservations we have towards previous models.

One major assumption that simplifies our model is that we do not expect the organization to be taken-over. The organization can be virtually taken-over in any stage of its life cycle, therefore it does not make sense to incorporate it directly to the model, although it is something a reader should bear in mind when thinking of organizational development. Also, we argue that these situations hardly affects organizational behavior until the last moment.

We consider five-stage model of Miller and Friesen (1984) well fitting the situation. Since we criticize some aspects of previous models (assumptions about structure etc.), we consider growth and level of formalism to be the key characteristics that distinguish individual stages from each other:

Proposition 1. The organization in its life cycle experiences (i) positive growth that is faster than market rate in growth stage; (ii) positive growth at market rate or stagnation in maturity stage; and (iii) negative growth in decline stage. For both founding and revival stages, there is not a distinguishable pattern of growth.

Proposition 2. The organization in its life cycle experiences rising levels of formalism from the founding stage, through growth and maturity, to decline stage. During the revival stage, the level of formalism decreases from previous levels.

In the case of growth stage, we expect it to take shape of S-curve, meaning that after founding, the organization that does not experience demise first go through

slow growth, followed by rapid growth and later slower growth when it experiences the transition to maturity stage.

Proposition 3. The organization growth in growth stage resembles S-curve with the relatively slower rate of growth in early and late part of the stage and rapid rate of growth in the middle part of the stage.

Although exceptions in other stages are plausible, we assume that organizations, besides following linear development of their life cycle, are also likely to demise right after founding. Otherwise, we expect them to demise only after going through decline stage. On the other hand, decline stage is not necessary for the organization to enter revival. Also, we consider revival to be a synonym for a successful change, while an unsuccessful change is a part of maturity and later decline stage. This largely fits the pattern observed among organizations by Miller and Friesen (1984). We illustrate the life cycle in Figure 1, where we also add examples to individual paths from the IT sector.

Proposition 4. Following its (i) founding, the organization can either demise or enter growth stage; from (ii) the growth stage, the organization can enter either decline or maturity stages; from (iii) maturity, the organization can enter either decline or revival stages; from (iv) decline, the organization can either demise or enter revival stage; and from (v) revival stage, the organization enters growth stage.

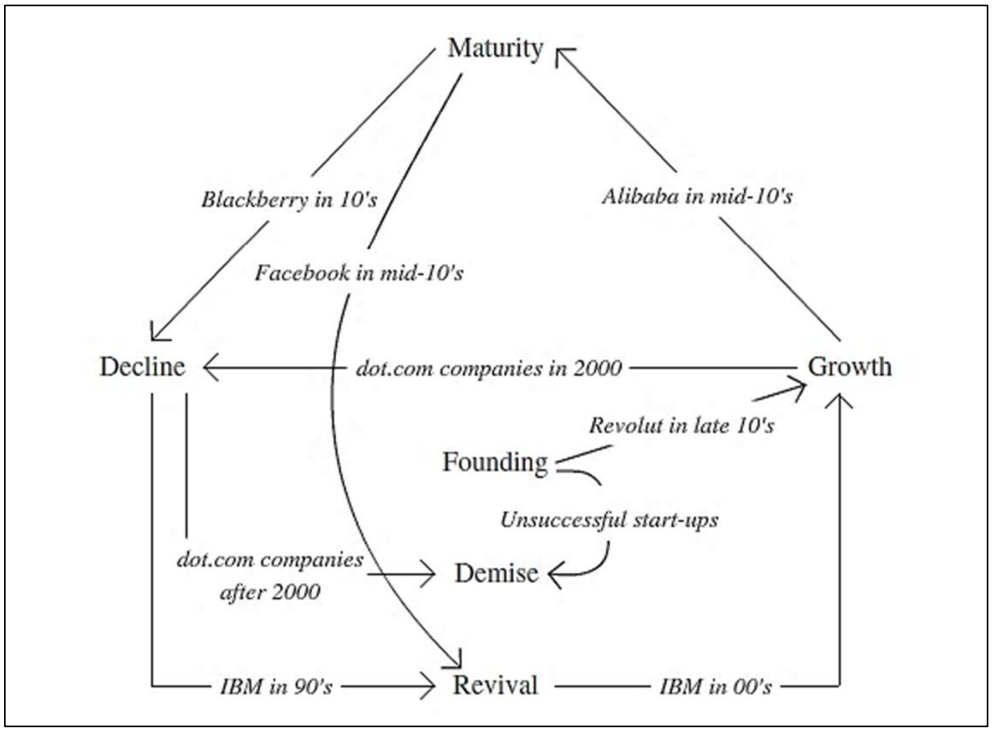

Figure 1 – Proposed Life Cycle Model – Paths Between Stages

4 LIMITATIONS AND FUTURE AGENDA

In our review, we focus on traditional organizational life cycle models. The theory itself has not developed much since its golden age in 70's and 80's (Dufour, Steane and Corriveau, 2018), yet it is possible that our traditionally conducted review may miss some recent studies that would enrich our perspective. Despite that, we believe that we present a concise picture of the organizational life cycle theory.

From our perspective, organizational life cycle theory offers a perspective on how to look on generic states of organizations that can enrich other streams of literature rather than a self-sustained analytical tool. Studies that attempt to empirically assess theoretical organizational life cycle models are rather scarce, questionable in methodology from today's perspective, or offer only partial support (e.g., Drazin and Kazanjian, 1990). This is from our point of view another of the major reasons why the theory is often neglected nowadays – it appears that its assumptions are not supported by real-life evidence. However, it is important to note that it went through its golden age when cross-sectional studies flourished, and that is a major contrast to its rather longitudinal nature (one of the exceptions is the seminal work of Miller and Friesen, 1984). We believe that an assessment using current empirical methods may paint a much different picture.

In our work, we offer several propositions that should be further empirically tested and can be used to infer assumptions about organizational development over time. As we already noted in the introduction and on other places in our review, since a life cycle stage – in which the organization currently is – affects its behavior (La Rocca, La Rocca and Cariola, 2011; Bellone et al., 2008), we consider it particularly fruitful for the field of behavioral strategy (Powell, Lovallo and Fox, 2011). Another interesting research agenda is linking firm behavior to the industry life cycle, as proposed in terms of break-even timing in the organizational life cycle. We believe that more of such contingencies are likely to exist.

5 CONCLUSION

In this review, we summarize major studies of the organizational life cycle theory. We agree that five major stages can be distinguished in the organizational life cycle: (i) founding; (ii) growth; (iii) maturity; (iv) revival; and (v) decline. We propose that growth and formalism should be considered to be major characteristics for distinguishing individual stages and we offer their likely evolution based on reviewed models. Besides that, we also propose likely paths between individual stages. Finally, we discuss limitations of the theory and offer some ideas on its future research agenda.

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APSS – Software Support for Decision Making in Statistical Process Control

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ABSTRACT

Purpose: SPC can be defined as the problem solving process incorporating many separate decisions including selection of the control chart based on the verification of the data presumptions. There is no professional statistical software which enables to make such decisions in a complex way.

Methodology/Approach: There are many excellent professional statistical programs but without complex methodology for selection of the best control chart. Proposed program in Excel APSS (Analysis of the Process Statistical Stability) solves this problem and also offers additional learning functions.

Findings: The created SW enables to link altogether separate functions of selected professional statistical programs (data presumption verification, control charts construction and interpretation) and supports active learning in this field.

Research Limitation/implication: The proposed SW can be applied to control charts covered by SW Statgraphics Centurion and Minitab. But there is no problem to modify it for other professional statistical SW.

Originality/Value of paper: The paper prezents the original SW created in the frame of the research activities at the Department of Quality Management of FMT, VŠB-TUO, Czech Republic. SW enables to link altogether separate functions of the professional statistical SW needed for the complex realization of statitical process control and it is very strong tool for the active learning of statistical process control tasks.

Category: Research paper

Keywords: statistical process control; selection of control chart; shewhart charts; nonconventional control charts; active learning

1 INTRODUCTION

Statistical process control (SPC) is an approach to process control that has been widely used in various industrial or non-industrial fields. SPC is based on so called Shewhart´s conception of the process variability. This conception distinguishes variability caused by obviously effected common causes (process is considered to be statistically stable) from variability caused by abnormal assignable causes (process is considered to be out of control).

The main goal of SPC (Keller, 2011; Montgomery, 2012; Oakland, 2011; Qiu, 2014, Thompson and Koronacki, 2002) is an identification of abnormal variability caused by assignable causes with the aim to:

- make the process stable,
- minimize the process variability,
- improve the process performance.

The application of SPC must be built as the problem-solving process (Noskievičová, 2010). By the SPC design the general structure of the problem-solving process must be respected and the sequence of the subprocesses "Out-of control signal revelation – Root cause identification – Corrective or improvement action acceptance – verification of action" must be the axis of every SPC application.

SPC as the problem solving process incorporate the decision making processes – i.e. many decisions about various statistical, methodological, social and economical factors affecting the efficiency of the SPC (Noskievičová, 2010). Decisions linked to the main goals of SPC refer to the out-of control signal revelation (1), identification of root cause of assignable causes (2), selection of corrective or improvement action (3) and their realization (4). There are many excellent accessible professional statistical programs such as Statistica (Dell Statistica Help, 2017); Statgraphics (Statgraphics Technologies, 2017); Minitab (Minitab, 2018) etc. But there is no SW support for very important decision which precedes activities (1) - (4): selection of the suitable type of the control chart (which is one of the most important activities influencing the efficiency of the whole SPC implementation) based on the properly made verification of statistical properties of data (Cox, 2006; Zimmerman, 2011). Above mentioned statistical software offer various types of control charts, various methods for data verification but there is no complex methodology how to select the best control chart.

For that reason the SW program in Excel called APSS (Analysis of the Process Statistical Stability), solving this failure of the professional statistical packages with additional learning functions was created at the Department of Quality Management of the Faculty of Metallurgy and Material Engineering, VŠB-Technical University of Ostrava, Czech Republic. The paper deals with goals, principles, functions and a structure of this program.

2 GOALS, PRINCIPLES AND FUNCTIONS OF APSS

2.1 Goals

The main goals of APSS are as follows (Noskievičová, 2015):

- Integration of partial steps of SPC into one complex solution;
- Support of learning of the decision-making activities in the frame of the verification and ensuring the statistical stability of the processes, i.e. by the selection of the suitable control charts and by the interpretation of the reached results;
- Increasing quality of the self-learning process.

2.2 Principles and Functions

APSS enables to realize activities (see Fig. 1) in one complex environment at all main connections. Except the application of particular control charts users will learn to select suitable control chart based on the statistical data analysis and to interpret correctly reached results.

APSS guarantees following functions: selfstudy, communication, decision-support, control, verification of obtained knowledge, data support, methodical support.

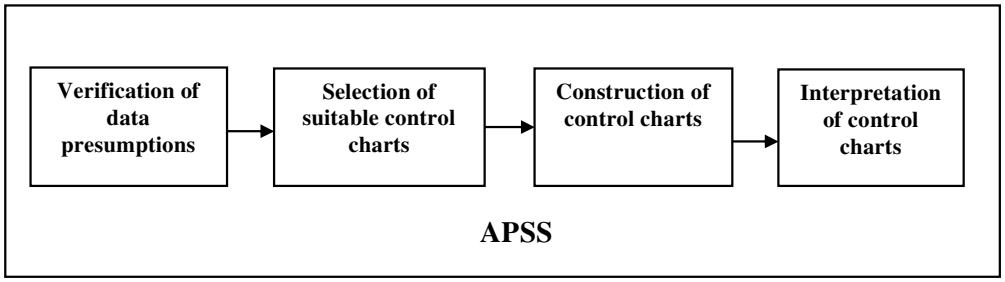

Figure 1 – The Basic Tasks of APSS (Source: Author's Elaboration)

3 APSS STRUCTURE

The basic structure of APSS with its basic elements and outer and inner relations is depicted on the Fig. 2. APSS itself forms the environment for practicing intended tasks, decision-making, verification of these decisions (testing questions and evaluation of the results), quick complementing missing knowledge (e-learning study materials written by the author of this paper concerning the problems of classical Shewhart and nonconventional control charts) and communication between user and professional statistical SW (APSS supposes that users are able to use professional statistical SW Statgraphics and Minitab). This professional statistical SW is used for the construction of control charts

selected by user, some activities connected to the control chart analysis and verification of data presumptions.

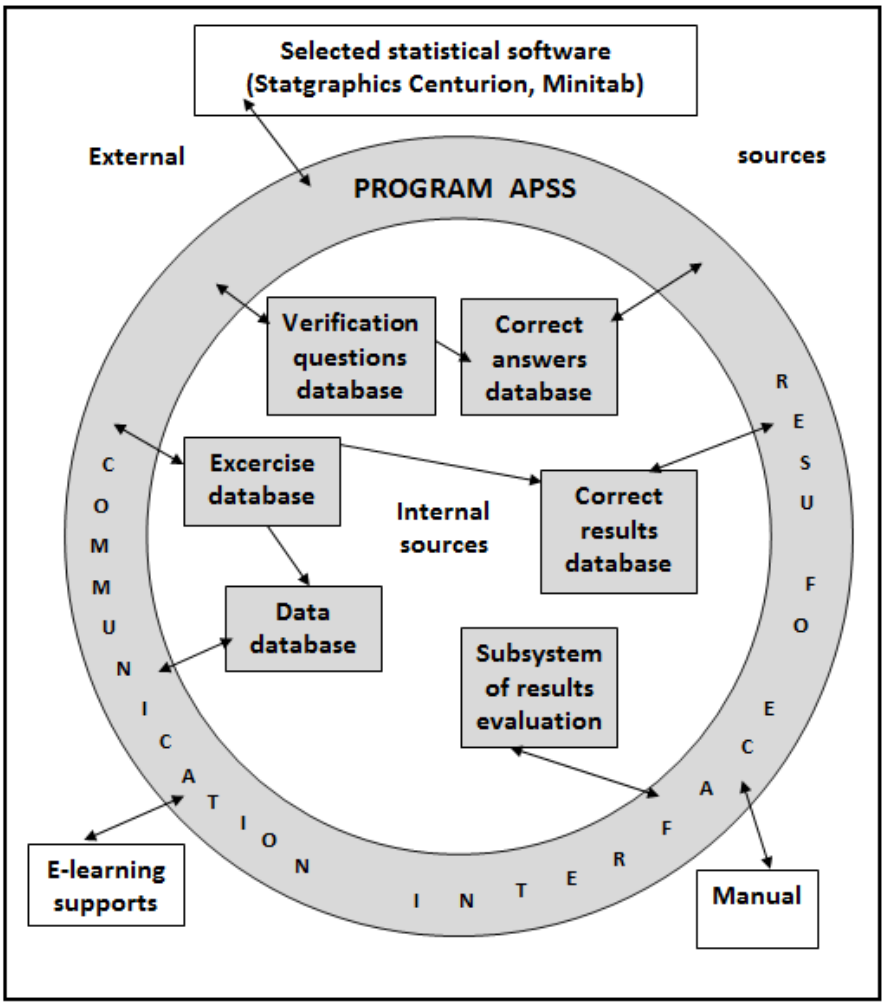

Figure 2 – Structure of APSS and its Basic outer and Inner Relations (Source: Author's Elaboration)

APSS has been created as an opened system. It means that all databases can be complemented and whatever statistical SW can be used (but under the condition of adequate changes in the exercises and database of correct results).

More detailed information about the structure, functioning and contents of APSS is given by Fig. 3.

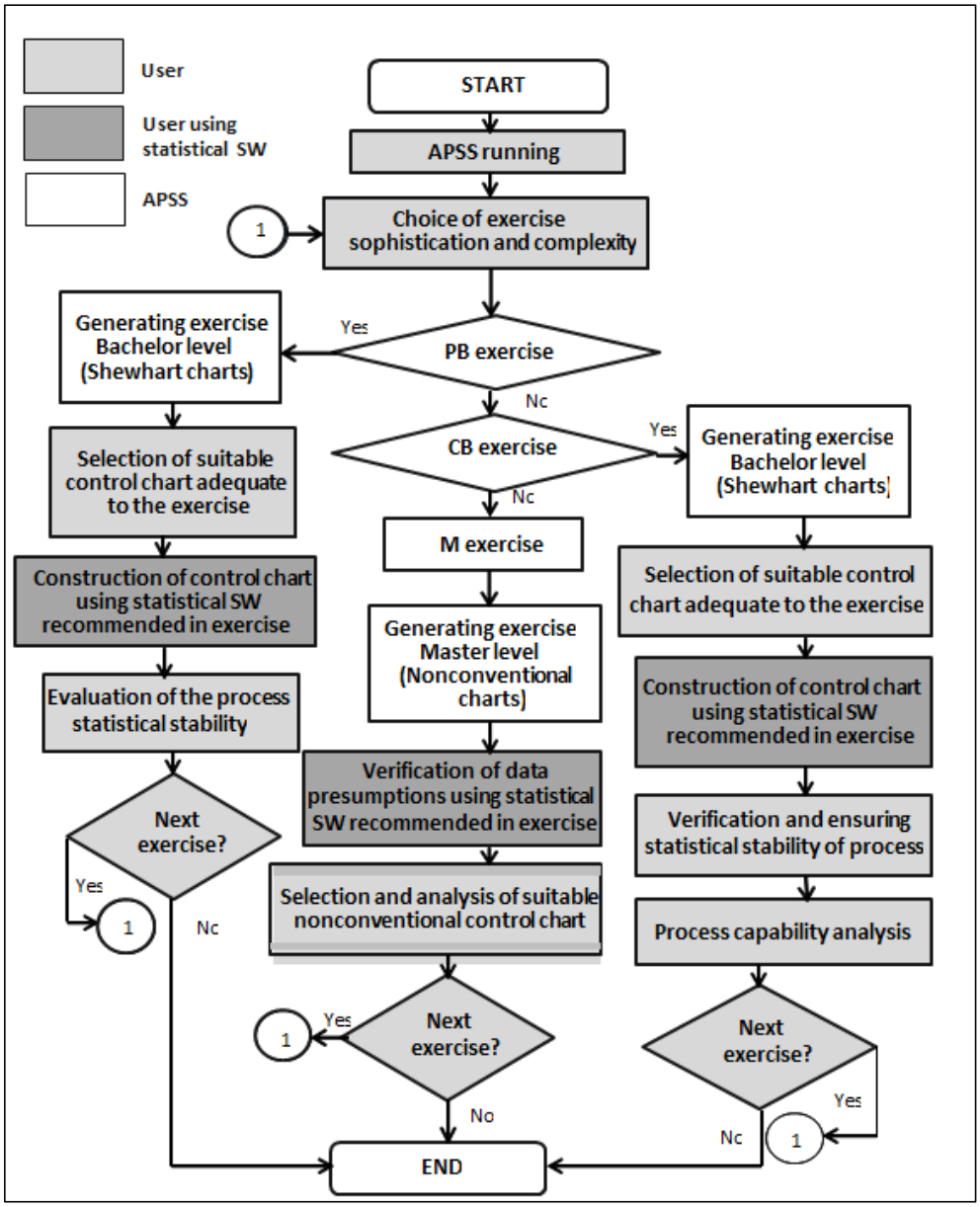

Figure 3 – Flow Chart of the Detailed APSS Structure
(Source: Author's Elaboration)

Steps in white blocks are done in the frame of APSS, the steps in grey ones are realized using the recommended professional statistical SW.

APSS is divided into three main modules according to the sophistication and complexity of exercises. The first module is dedicated to the solution of particular bachelor (PB) exercises – it covers selection and analysis of Shewhart conventional control charts. The second module corresponds to the bachelor level

of knowledge of SPC and it is dedicated to the solution of complex bachelor (CB) exercises – in addition to the previous module it contains also process capability analysis. The third module corresponds to our master level of knowledge of SPC (M exercises). It covers selection of suitable nonconventional control chart and its analysis when data presumptions for the application of Shewhart conventional control charts are not met. This module also contains verification of these data presumptions. All modules have the same feature – from every communication screen of the program the user is able to the solved exercise, the exercise data or to the manual.

In the next paragraphs there is more detailed description of these modules.

3.1 Module of PB Exercises

This module starts with automatic generating exercise. Then the selection of suitable control chart is done. When the selection is not correct the user is recommended to move to the e-learning texts which are linked to APSS and to study the problem. Then the verification test in APSS is activated. The user must reach 10 points otherwise he must repeat the whole test with upgraded questions. When the selection of control chart is correct the parameters of control chart (subgroup size n and number of subgroups k) are entered. If these values are not correct the user is recommended to go back to the exercise and study it carefully again. Having correct parameters n and k the user must open SW recommended in the exercise, copy the data from the exercise into it and to construct previously selected control charts. User´s results are then compared to the correct solution in APSS. When there is no conformity the user is recommended to move to the e-learning texts and to study the problem. In the case of the conformity APSS continues by the verification of the user knowledge about statistical stability analysis. When his answers are not correct he is recommended to move to the e-learning texts and to study the problem. When answers are correct the user must move to the applied statistical SW and to verify statistical stability of the process from the solved exercise. His results are again compared to the correct solution. After it there are some questions about the following steps of the SPC. In the case of incorrect answers there is again need to study the problem using the linked study texts. Otherwise the user can choose the next exercise or to finish.

3.2 Module of CB Exercises

This module contains the whole previous module and after verification of statistical stability it asks the questions about capability analysis. When answer is not correct the user must move to e-learning material. Then he must go to the opened statistical SW and to recompute control limits of the previously constructed and analysed control chart. Then the estimated values of the process parameters needed for the capability indices computations are entered into APSS. Again APSS compares the user results with the correct solution. When there is no conformity the user must go back to the setting the estimations of the process

parameters and again to compute capability indices. Otherwise he can continue with the interpretation these results. When his conclusions are not correct the user is recommended to go to the linked e-learning materials and to study the problem. In the case of the correct interpretation the user can choose the next exercise or to finish.

3.3 Module of M Exercises

This module teaches the user to verify data presumptions using suitable statistical tests and to select suitable control charts based on this statistical analysis. It contains 5 branches. The first branch enables solution when data are not normally distributed. The second branch gives solution in the case of data autocorrelation; in the third branch the user learns to solve the situation when little changes of the process parameters must be identified; the fourth branch is dedicated to the problem of the lack of the data about the process and the last branch offers solution when more then one quality characteristic must be watched simultaneously.

4 CONCLUSION

This paper deals with the description of the software product which was worked out for the practicing selection of the suitable control chart based on verification of the data. In the first chapter SPC is defined as the problem solving incorporating many decisions including also selection of the suitable control chart which must be based on the verification of the data presumptions. The second chapter is dedicated to the description of the goals, principles and functions of APSS (Analysis of the Process Statistical Stability), SW program programed in Excel, that was created in the Department of Quality Management at the Faculty of Metallurgy and Material Engineering, VŠB - Technical University of Ostrava, Czech Republic to support correct selection of control charts. In the third chapter there is general description of the whole program and also more detailed characterization of its parts. The program is very useful instrument for learning how to correctly choose suitable control chart based on the verification of the data properties.

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Method of Supplier Selection by Means of Correlation of Quality and Cost Characteristics of Products

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ABSTRACT

Purpose: When choosing a supplier, many companies give priority to the lowest cost of products. Problems arise when the consumer wants to buy products with several better quality characteristics, but the products have only one of them. The aim is to establish a link between the quality characteristics of the product and its market value in terms of consumer benefits.

Methodology/Approach: The proposed model is based on determining the importance of criteria that determine the indicators of quality, reliability, characteristics of products and their comparison with the market price at which these products are supplied to the consumer. The model is built on the basis of statistical processing of the data received from consumers about preferences at the choice of production.

Findings: The method of determining the optimal supplier based on the cost and quality indicators of the product. Some indicators of the quality of products and their ranking by significance for the consumer are given. It gives the examples of calculation methods for univariate and two-factor analysis. It shows the ways of diagramming the determination of values of factors of production.

Research Limitation/implication: The model is relevant only at close market value of production for the consumer.

Originality/Value of paper: The methodology of criteria-based evaluation of the quality indicators of the supplied products or services allows making a selection of a products supplier on the basis of quality characteristics of the supplied products.

Category: Research paper

Keywords: supplier selection; the quality of the products; the reliability of the supplier; multivariate analysis

1 INTRODUCTION

In today's world, contracts for the supply of components, products or services, are concluded at the end of the auction. According to the rules of auctions, the person who has offered the best contract from the financial point of view, taking into account the requirements of the customer, is declared the winner. Thus, the only criterion for selection of the contractor under the contract is the contract sum proposed by the contractor. A lot of companies conclude contracts with suppliers directly, without auctions. In this case selection criteria of the contractor are the amount of the contract and the quality of work or of the supplied equipment, components etc. If the amount priority of the contract is clear, than the quality characteristics are mapped according to the principle: those, whose values are above, are preferred. It often happens that the procurement services of companies are faced with a situation when different suppliers have opposite values of the indicators of interest of products and inversely proportional values of the contract amount or when it is required to choose the products on several quality parameters which don't state the obvious leader. This choice affects the economic, logistic and production characteristics of the finished product of the customer (Shalygin, 2012). In such cases, various existing techniques are used, including estimations (Sysolyatin, 2014), analyze the variables that impact quality in a manufacturing environment (Omachonu, Suthummanon and Einspruch, 2004). The approach closest to the proposed methodology is proposed by Visawan and Tannock (2004) is based on costs and benefits Hajduova (2014) based on an estimate of the cost of improving processes.

One of the ways to improve the competitiveness of the enterprise in procurement is the paradigm of "flexibility" described in the works by Goldman and Nagel (1993) and Goldman, Nagel and Preiss (1995) which is characterized by the ability to respond to frequent and unpredictable changes. Many existing priority-setting methods have limited application, as they consider only independent evaluation criteria as defined in article Gallouj and Weinstein (1997). Saaty (1996) it is proposed to use the analytical hierarchy process to establish the relationship between criteria and alternatives, which can be used as the cost of production. Lin and Hsu (2008) when independence among different elements of a system assumption is violated and takes into account the degree of the interdependence among them. In this paper, we consider the innovations that are characteristic of wholesale trade in terms of the interdependence between the factors that take into account the qualitative aspects of flexibility. Agovino at al. (2017) presents the methodology for constructing the index of efficiency of firms, taking into account both the quantity and quality of research. However, this paper does not take into account the cost of the final product obtained from scientific research.

The article by Sánchez Vijande and Gutiérrez (2012) examines the impact of value creation functions on satisfaction and loyalty in business markets. Based on the study, the authors point out that the satisfaction of the distributor largely

depends on the indirect value creation functions performed by the manufacturer. Distributors loyalty is directly affected by indirect value creation functions, but there is no evidence that benefit, volume and protection functions do this.

Effective resource management is critical in terms of duration, cost and quality of the product to the consumer. In work Tran et al. (2018), researchers have developed several models to help planners in developing practical and near-optimal schedules for repetitive projects. Despite their undeniable advantages, such models do not have the possibility of pure simultaneous optimization, as existing methodologies optimize the schedule in relation to one factor to achieve the minimum duration, total cost, resource interruptions or different combinations, respectively.

In the paper by He, Chan and Tse (2008) examines the relationships between consumer satisfaction, price tolerance and repurchase intention. The estimation of consumers' tolerance to growth/decrease in prices is made. Results show that satisfied consumers may not necessarily be willing to accept an increased price for competitive services while less satisfied consumers certainly demand some price discounts. It is shown that since the maintenance of satisfied consumers by improving the quality of services is cheaper for firms than attracting less satisfied ones by reducing prices, efforts to satisfy consumers are paid off by increasing consumer loyalty and, consequently, the profitability of firms, but the quality characteristics of products that satisfy the consumer are not considered.

The most closely considered situation is described in the article by Ebrahimipour Shoja and Li (2016). The proposed model is based on the product life cycle and its impact on the choice of the supplier, the structure of the product, competitive supply environment and various criteria for assessing the quality of the product. As an illustration of the model, scenarios describing the structure of the product, uncertainty in purchase prices, reliability of purchased components, machine downtime due to poor quality of components, power of suppliers and delivery times are presented. However, the proposed model does not take into account the final cost of production and the ratio of cost and quality of the product for the end user.

The purpose of this article is to offer methodology and criteria-based evaluation of the quality indicators of the supplied products or services subject to price delivery.

2 METHODOLOGY

The article offers to do assessments by comparing criteria assessment of proposals of suppliers costs.

$$\Phi = k_1 X_1 + k_2 X_2 + \cdots + k_n X_n \tag{1}$$

where Φ - is the criterion of proposal of suppliers, taking into account the amount of the contract; k - is the weighting factor; X - is the considered quality factor of the products; n - is the number of the considered factors.

Suppose, we consider a potential supplier with the contract amount P. The supplier's products correspond to the factors of interest to consumers $F_1, F_2 \ldots F_n$. The supplier's reliability is estimated by the expression:

$$H = \frac{N - N_f}{N + 1} \tag{2}$$

where N - is the number of the contracts, concluded by the contractor earlier with the potential supplier; N_f - is the number of the contracts which were executed by the supplier efficiently, in time, in full compliance with the contractor's requirements.

The supplier's reliability indicator may vary within [0;1], and for a reliable supplier the indicator $H \to 0$. For a new supplier, unknown to the customer, the value of the reliability indicator should be $H = 0.5$.

To determine each quality factor of the products it is necessary to graph the function:

$$f(x) = \frac{F_i}{x \cdot F_{st\,i}} \tag{3}$$

where F_i – is the quality factor of the products of interest to the customer; $F_{st\,i}$ - is the minimum value of the factor, determined by the contractor, based on the contractor's requirements, standard and so on; $x \in [0.1; 1]$.

A separate function is built for each factor and marked in the diagram. The contract amount P, proposed by the potential supplier, the highest price which the contractor is willing to pay under the contract C_{max}; the minimum price which the customer believes is reasonable C_{min}; the average price in the market for similar products C_{mid} are marked in the diagram on the axis OY_2.

The value of X_n is calculated for each factor as the abscissa of the point of intersection of the graph of the function $f_n(x)$ and the value of the contract amount P, proposed by the customer. If the point of intersection is above the line of the maximum allowable price C_{max} or below the line of the minimum allowable price C_{min}, than the value of this factor should be considered high or low, respectively.

The expression (1) is used to calculate criteria Φ for each of the considered suppliers. The weight factors k are determined based on the importance of each individual criterion with the coefficient for the customer, given the conditions, that $k_1 + k_2 + \cdots + k_n = 1$.

Suppose, we consider the potential suppliers 1 and 2. The amounts proposed for the contract by the suppliers P_1 and P_2, respectively, and $P_1 > P_2$. The highest and the minimum prices which the customer is willing to pay for the contract are respectively C_{max} and C_{min}. It is important for the customer that the values of the quality factor F are the more the better. The values of F factors for each potential supplier are F_1 and F_2, and $F_1 < F_2$.

The customer concluded contracts with each of the potential suppliers, than expression (2) is used to determine the reliability of each of the potential customers H_1 and H_2. Taking into account that only one quality factor is considered, it is possible to mark two suppliers in one graph (Fig. 1).

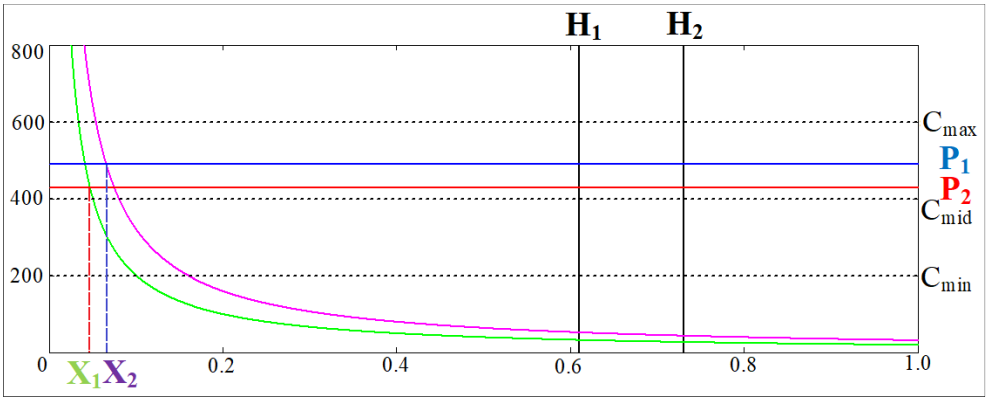

Figure 1 – Diagram of the Evaluation of Factor Values

Using the diagram we determine the values of the quality factors in the studied criterion for each potential supplier X_1 and X_2. Given that only one factor is considered, the value of the weighting factor is taken as one for each supplier $k_1 = 1$. Than it is obvious that the value of criterion Φ_2 is more than the value of criterion Φ_1.Thus, supplier 2 should be preferred when concluding a contract.

In case of equal values of the quality factors X_1 and X_2, for univariate analysis, a choice should be made taking into consideration reliability of the supplier, in that case expression (1) takes the form:

$$\Phi = k_1 \frac{X_1}{H} + k_2 \frac{X_2}{H} + \cdots + k_n \frac{X_n}{H} \tag{4}$$

3 RESULTS

Suppose that you want to buy a cell phone. The highest price which the customer is willing to pay is $C_{max} = 1050\$$, the minimum price is $C_{min} = 950\$$. The average price on the market is assumed equal to the average value between minimum and maximum prices $C_{mid} = 1000\$$. As factors, important for the

supplier, we choose the battery capacity (operation time without recharging) F_1 and storage capacity F_2. In this case, preference is given to large values of these factors.

In a suitable price range and closer to the value C_{mid}, there are the smartphones of the companies A and S. The price of the smartphone of company A on the market is $P^A = 1015\$$, the price of the smartphone of company S is equal to $P^S = 999\$$. As the products of these suppliers have never been purchased before we take for them equal reliability indexes $H_1 = H_2 = 0.5$. For supplier A the values of the factors are $F_1 = 1960\,mAh$, $F_2 = 256\,GiB$, for the supplier the values of the factors – $F_1 = 3500\,mAh$, $F_2 = 64\,GiB$. Using the expression 3 let's build graphs of functions for each of the criteria F (Fig. 2) and F_2 (Fig. 3).

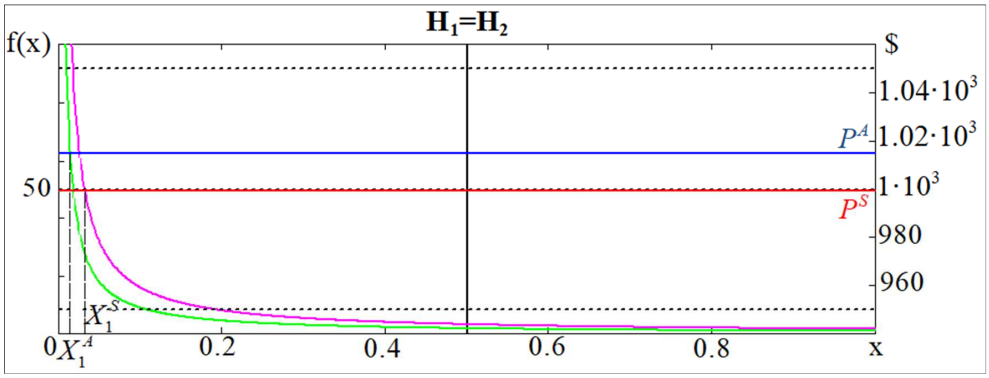

Figure 2 – Diagram of Rating Factor F1 Value

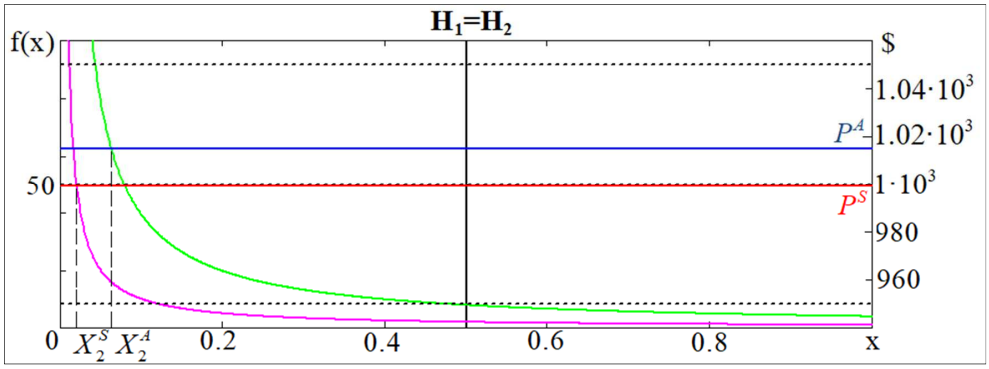

Figure 3 – Diagram of Rating Factor F2 Value

The minimum requirements for the factors are adopted, the smartphone must have the battery capacity more than $F_{st\,1} = 2200\,mAh$ and storage capacity more than $F_{st\,2} = 65\,GiB$. All the calculations are summarized in Tab. 1.

Table 1 – Values of Factors and Parameters

Designation	Company *A*	Company *S*
P	1015	999
H	0.5	0.5
F_1	1960	3500
F_2	256	65
C_{max}	1050	
C_{min}	950	
C_{mid}	1000	
$F_{st\,1}$	2200	
$F_{st\,2}$	65	
k_1=k_2	0.5	
$f_1(x)$	$\frac{F_1}{x \cdot F_{st\,1}}$	$\frac{F_2}{x \cdot F_{st\,2}}$
$f_2(x)$		
X_1	0.014	0.033
X_2	0.062	0.021
Φ	0.038	0.027

Thus, the values of the factors for company A are equal to $X_1^A = 0.014$, $X_2^A = 0.062$, for company S they are equal to $X_1^S = 0.033$, $X_2^S = 0.021$. As each of the factors is equally important for the customer, the weighting factors are assumed to be equal $k_1 = k_2 = 0.5$, than using expression (1) we define the offer criteria of the companies $\Phi^A = 0.038$, $\Phi^S = 0.027$, hence we see that $\Phi^A > \Phi^S$. So, the products of company A should be preferred.

4 CONCLUSION

This document provides a methodology for selecting a supplier of products or services. Under this methodology introduces a weight quantity of the product characteristics on which the plot of the values of the factors. When comparing the value of factors, the choice is made in favour of a product or service.

The methodology of criteria-based evaluation of the quality indicators of the supplied products or services allows making a selection of a products supplier on the basis of quantity characteristics of the supplied products. The methodology is based on comparing the characteristics of the product or service with the price of the product. The value of all the variables present in the methodology can be obtained from the supplier.

The methodology allows you to choose a supplier not only based on product prices and quantitative factors, but also to assess the importance of these factors for the end user based on his needs.

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Processes of Value Co-creation at a Tourist Accommodation

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ABSTRACT

Purpose: This paper aims to study how a pair of hosts for one bed and breakfast establishment and their guests create value for the visit by communicating and interacting with each other on the island of Gotland.

Methodology/Approach: A case study was conducted on one single Bed and Breakfast (BnB) accommodation. An interview and a Questionnaire study were performed.

Findings: The study shows that there are several processes involved in the co-creation of values between visitors and hosts. Co-creation processes begin already when visitors are planning their visits to the island. Their expectations are created while choosing their accommodation type, often done online on different websites. Pre-information about the chosen BnB accommodation contributes to visitors' expectations and image of the object, which can be seen as a part of their identities. In the physical meeting with the accommodation and the hosts and other guests, the co-creation process is strengthened. There are processes of participation, communication, creation of meaning for the stay, processes of trust and responsibilities which all together create a common culture which in turn contributes to co-creation of values for both parties. These processes also take place between guests. The processes are furthermore dependent on meaning-making and sensemaking processes. This all together generate knowledge about the destination and the values that enhance the positive experience of the visits. It also creates knowledge for the hosts about how they can develop their service to achieve increased customer satisfaction. Finally, these skills can be valuable for the continued planning and development of the tourism industry.

Research Limitation/implication: The study is limited to a one single BnB accommodation with its hosts on the island of Gotland in Sweden.

Originality/Value of paper: The study makes a contribution to the knowledge of processes of co-creation values by exploring how some visitors and their hosts experienced visits to the island. The study can help bridging the gap in the views and actions on co-creation of values among visitors and those who are visited.

Category: Research Paper

Keywords: BnB accommodation; experiences; processes of value co-creation; sensemaking

1 INTRODUCTION

Tourism is today one of World's and also Sweden's most promising industries. The tourism industry on the island of Gotland has been an important economic factor for more than 150 years (Tillväxtverket, 2016). The biggest challenge for tourism in the future is to achieve local sustainable development (Byrd, Cárdenas and Greenwood, 2008). The concept of the experience economy states that as services become increasingly commoditized, companies must look to differentiate their offerings by focusing on the design and delivery of experiences (Pine and Gilmore, 1998). Experiences indicate the next step in the progression of economic value, requiring businesses to shift from a delivery-focused service paradigm to one that recognizes that the service is simply the arena to engage individual customers in a personal way (Walls et al., 2011).

In a hospitality and tourism setting, according to Oh, Fiore and Jeoung (2007), can everything tourists go through at a destination become an experience: being it behavioural or perceptual, cognitive or emotional, or expressed or implied experiences (Oh, Fiore and Jeoung, 2007). Visitors play an active, co-creative role in determining and constituting value-in-use through resource inputs in their experiences in destinations (Prebensen, Vittersø and Dahl, 2013). In the industry, experience-related research is well presented but remains still underrepresented in the area of hospitality and tourism research (Ritchie, Wing Sun Tung and Ritchie, 2011).

In the shift towards sharing and collaborative consumption has caused notable implications for the accommodations industry. Probably the most famous organizer of private run bed and breakfast providers is Airbnb, grounded 2008. The organization has faced several and severe resistance from the established accommodation industry. Nevertheless, they have managed to become one of the largest organizers for private accommodation booking platforms online for tourists around the world. (Barnes and Mattsson, 2016). The number of other Bed and Breakfast (BnB) accommodations are today increasing and also very popular among travellers visiting the island of Gotland in Sweden. They are usually small family owned BnBs with only a few rooms for renting. The tourist season on the island is concentrated mostly to the summer months, June, July and August.

Bed and breakfast accommodations are not merely a conventional medium for the exchange of hospitality products (Katz, 2015) but serves as a stage for socio-cultural exchange. In contrast to tourists staying in the traditional accommodation sector, BnB accommodations offer a window into local experiences, in which guests can extend their footprint by immersing themselves and discovering the local community (Fang, Ye and Law, 2016).

Accommodations can symbolize more than the traditional sharing of a space (Barnes and Mattsson, 2016) and fosters the sharing of a local social place (Tussyadiah and Pesonen, 2016). While studies into experience and value co-creation have received much attention in recent tourism and hospitality studies (Morosan and DeFranco, 2016; Neuhofer, Buhalis and Ladkin, 2012; Shaw, Bailey and Williams, 2011), there is still a gap in understanding how experiences and values are created in collaborative marketplaces, such as Airbnb, and the wider sharing economy (Yannopoulou, Moufahim and Bian, 2013).

Wilson and Harris (2006) point out, that meaningful travel involves the search for an increased sense of self and reconsideration of perspectives on life, society and relationships with others. It is also emphasized by Boswijk, Thijssen and Peelen (2007) that the dynamic nature of meaningful experiences can lead to personal insight for customers.

With reference to the aspects discussed above this paper aims to study how one bed and breakfast provider and their guests experience the processes of co-creation of values and sensemaking while socializing and communicating with each other. This particular accommodation is family owned establishment using Airbnb's booking and service system.

In order to be able to describe these processes, the model of sensemaking by Weick is used as a theoretical as well as a methodological foundation for the study.

2 THEORETICAL ASPECTS OF THE STUDY

2.1 Consumers as Co-Creators

Co-creation is described in the experience economy as an environment, in which the supplier constructs context and the consumer is part of it (e.g. Disneyland). Bendapudi and Leone (2003) argue that the co-production may extend even further and is not only about customers' involvement and participation in a physical sense but may also include psychological aspects.

Based on the S-D logic, service-dominant logic of marketing, customers and firms co-create value through an integration of a set of resources (Vargo, Maglio and Akaka, 2008). The findings of Agrawal and Rahman (2016), reveal the presence of three primary resources that form the basis of collaborative value co-creation efforts in bed and breakfast settings, namely, BnB home, places in the

local community and the host as a distinct value creating actor. While the BnB home and places in the local community can be conceptualized as physical operand resources, the host emerges as a distinct operant resource (skills and knowledge) and a key resource integrator who, outside tourist zones, creates the basis upon which social practices and value co-creation can occur (Saarijarvi, Kannan and Kuusela, 2013). But how does this co-creation of values emerge in practice, individually and in collective meaning? These are questions that will now be investigated in the following sections.

2.2 Meaningmaking and Sensemaking

Meaning-making as a concept is described in psychology, as a process of through which people construe, understand, or make sense of life events, relationships, and the self (Ignelzi, 2000). Through meaning-making, persons are retaining, reaffirming, revising, or replacing elements of their orienting system to develop more nuanced, complex and useful systems (e.g. Gillies, Neimeyer and Milman, 2014).

The term is widely used in constructivist approaches. (e.g. Dorpat and Miller, 1992). The term is also used in educational psychology (Ignelzi, 2000; Mortimer and Scott, 2003).

Sensemaking, again, has been described as a process by which we give meaning to our collective experiences. It is often formally defined as the ongoing retrospective development of plausible images that rationalizes what people are doing (Weick, Sutcliffe and Obstfiel, 2005). The concept was introduced to organizational studies by Karl E. Weick in the 1970s and has since had an impact on both theory and practice. The concept was intended to favour a shift away from the traditional focus of organization theorists on decision-making and aiming towards the processes that constitute the meaning of the decisions that are enacted in behaviour. Research on sensemaking has become an important issue in organizational studies and has been growing as more researchers seek answers to how meanings are created in organizations (Hernes and Maitlis, 2013; Cornelissen, 2012; Monin et al., 2013).

Although Karl Weick is undeniably regarded as the founding father of sensemaking, his thoughts on organizational significance have been developed theoretically in different directions in the 21st century. The current post-Weick sensemaking research field is considered fragmented (Brown, Colville and Pye, 2014). The position of sensemaking research in science is controversial today. Maitlis and Christianson (2014), also, Brown, Colville and Pye (2014), argue that there is no single sensemaking thinking, but several different views. Some researchers consider it a theory of sensemaking theory (e.g. Skålén and Strandvik 2005).

Other scientists talk about sensemaking lenses (e.g. Maitlis and Sonenshein, 2010; Colville, Pye and Carter, 2013). The sensemaking perspective approach is also used in sensemaking literature (e.g. Shahzad and Muller, 2016).

Weick identified seven properties of sensemaking (Weick, 1995): Identity and identification are central. Who people think they are in their context shapes what they enact and how they interpret events (Pratt, 2000; Currie and Brown, 2003; Thurlow and Helms Mills, 2009). Retrospection[1] offers the opportunity for sensemaking. The point of retrospection in time affects what people notice (Dunford and Jones, 2000), thus attention and interruptions to that attention are highly relevant to the process. A recent study, however, shows that sensemaking can be time-oriented for both the past, present and future (e.g. Gephart, Topal and Zhang, 2010).

Gephart, Topal and Zhang (2010) state that perceptions of the future are always based on the present and the past, and thus future-oriented thinking does not reject retrospectives. Gephart, Topal and Zhang (2010) have raised an ethnomethodological approach to sensemaking's timely question. According to the thought, the sensemaking takes place in size and does not have a temporal beginning or end. Thus, the temporal nature and location of the sensemaking cannot be shown. (Maitlis and Christianson, 2014). People enact the environments they face in dialogues and narratives (Bruner, 1991; Currie and Brown, 2003). While speaking, people build narrative accounts which are helping them to understand what they think and organize their experiences as well as control and predict events (Isabella, 1990; Weick, 1995; Abolafia, 2010) and reduce complexity in the context of change management. Sensemaking is a social activity in that plausible stories are preserved, retained or shared (Isabella, 1990; Maitlis, 2005). However, the audience for sensemaking includes the speakers themselves (Watson, 1995). The narratives are both individual and shared, an evolving product of conversations with ourselves and with others (Currie and Brown, 2003). Sensemaking is ongoing by individuals simultaneously shaping and reacting to the environments they face.

People learn about their identities by projecting themselves onto this environment and observing the consequences and the accuracy of their accounts of the world (Thurlow and Helms Mills, 2009). This is a feedback process so even as individuals deduce their identity from the behaviour of others towards themselves, they also try to influence this behaviour.

As Weick argued, the basic idea of sensemaking is that reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs (Weick, 1993). People extract cues from the context to help them decide on what information is relevant and what explanations are acceptable (Salancick and Pfeffer, 1978; Brown, Stacey and Nandhakumar, 2007). Extracted cues sort out points of reference for linking ideas to broader networks of meaning. They are simple, familiar structures that are fragments from which people create a larger understanding of what may be occurring

[1]Identity can be understood through multiple frames of reference. The core idea in the different definitions is: "Identity is what construes a person, that is, who I am, to which I belong. It contains the essence of being self, which separates me from others" (Gioia, 1998, pp. 19).

(Weick, 1995). People favour plausibility over accuracy in descriptions of events and contexts (Abolafia, 2010).

An obsession with accuracy seems fruitless and impractical among people with multiple shifting identities in shaping their world, according to Weick (1995).

The research on sensemaking in this study can be seen as procedural. Many post "weckian" theorists such as Cornelissen (2012), Hernes and Maitlis (2013), Gephart, Topal and Zhang (2010), and Maitlis and Christianson (2014) emphasize the processuality of sensemaking and diverse art of the process. The process is dynamic, active and continuous (e.g. Gephart, Topal and Zhang, 2010). Another factor contributing to this study is the social nature of the process hosts interacting with their guests. According to Weick (1995), sensemaking takes place in interaction with the members of the organization, but also intersubjectively. Collectively shared meanings, build on such an organization a reality that enables members of the community to function in a meaningful way (e.g. Gephart, Topal and Zhang, 2013; Hernes and Maitlis, 2013; Maitlis and Christianson, 2014). Among others, Cornelissen (2012) and Maitlis and Christianson (2014), emphasize the significance of the environment in the sensemaking process.

According to the Weick (1995), there are three stages of the sensemaking process. The first step of the sensemaking process consists of three stages: noticing, bracketing and creating an initial sense. In this phase, existing information is screened and explanations are searched for an event that interferes with the activities of the members of the organization. Hinting, becoming conscious, and brainstorming can only take place on the individual existing informational frameworks, i.e. mental models, which in turn are based on previous experiences (Weick, Sutcliffe and Obstfeld, 2005). Creating an initial sense is done through categorization. Weick and his partners use the term labelling.

The labelling phase is looking for credible explanations for what happened. Phase two includes the interpretation of clues, the formation of intersubjective meanings, and the construction of a cognitive map.

Action is an essential part of the sensemaking process. Weick (1995) asks in his book, Sensemaking in Organizations, an important question: How does the action become coordinated in the world of multiple realities? Weick's answer is through communicative interaction. Brown, Stacey and Nandhakumar (2007) suggest that organizational activities are coordinated with narrative structures as they create the organization and its social reality. Weick states that activity generates raw material for sensemaking. It also creates the hints and stimuli needed to start the process, which in turn reinforces the process. This is important because it tests the understanding and gives feedback on the understanding that is generated in the process, and at the same time, it creates the basis for new meaningfulness. Thus, activity and cognition belong together (Weick, 1988).

These theoretical aspects, presented above, are used in this study as a foundation for analysing and understanding the processes involved in the interaction between guests and hosts at the BnB accommodation. Both meaning making and sensemaking is to be seen as processes involved within the interaction between guests and hosts, in this study, at the BnB accommodation.

3 METHODOLOGY AND DEMARCATIONS

In this study, a process-oriented perspective is used. Sensemaking and co-creation processes are closely related to one another (Hernes and Maitlis, 2013). However, the process is an ambivalent term. It can be understood either in organizations as visible artefacts, such as language, meaning, social interaction or power-related relationships, or it can be understood ontologically as an expression of reality (Chia, 2010).

From the point of view of the artefacts, the process can also be seen as a series of activities in which members of the organization are seeking understanding of unclear and confusing events in the operating environment. Sensemaking can be seen as a non-linear process. It does not happen in certain periods, but the process functions overlap and their intensity varies. The process is different for each member of the organization (Thurlow and Helms Mills, 2009).

This study is of qualitative and explorative art (Yin, 1994) and was performed as a case study in one single bed and breakfast accommodation. An interview and questionnaire study were conducted. The questionnaire was digitally sent to some 50 visitors or couples and their 2 hosts after their visits.

The respondents consisted of 46 couples who got interviewed at the accommodation and two hosts. The questionnaires were send them digitally after their visit and can even be seen as an evaluation of the experiences of the visit. Both interviews and questionnaires followed the same type of design. This design, in turn, followed and was inspired of Weick's seven properties of sensemaking.

Demarcations of the study are that it consists only one bed and breakfast accommodation and their guests and hosts. In this study sensemaking is seen as both cognitive and constructive approach.

The analysis of the processes in the study follows the theoretical framework of sensemaking and co-creation of values. The involved processes, supporting processes (encounters) as well as main process, are to be seen as interconnected. The sensemaking process has certain features. The seven qualities of the process, according to Weick (1995), are used as analyse criteria as well as the logic of three phases or stages of the sensemaking process: a) awakening, b) interpretation, building intersubjective meanings and creating a cognitive map, and c) action. The thematic analysis of processes resulted in the emergence of

distinct themes of social practices, practice elements and value formations, which are presented in the findings in next section.

4 RESULTS – REVEALING A PROCESS-BASED FRAMEWORK

The selected data shows several processes involved in the meeting of hosts and guests while planning, meeting, discussing and participating in the social construction of accommodating on one single bed and breakfast establishment. The study revealed both support processes and main processes. In the following sections, these processes are presented in short with some respondent statements and figures over the results.

4.1 Encounters

In the following, encounter processes of value-co-creation are presented with a help of the Fig. 1. Encounters. Some statements from the respondents on each encounter are presented. Both parties in the co-creation process, hosts and guests, and their perspectives are explored and discussed in this study. Encounters can be seen as the processes that seem to be leading to co-creation of values for both hosts, in taking care of and offering accommodation for the guests; as well as to the guests, who are staying in bed and breakfast accommodation. Encounter processes are the processes and practices of interaction and exchange that take place between hosts and guests within social interaction.

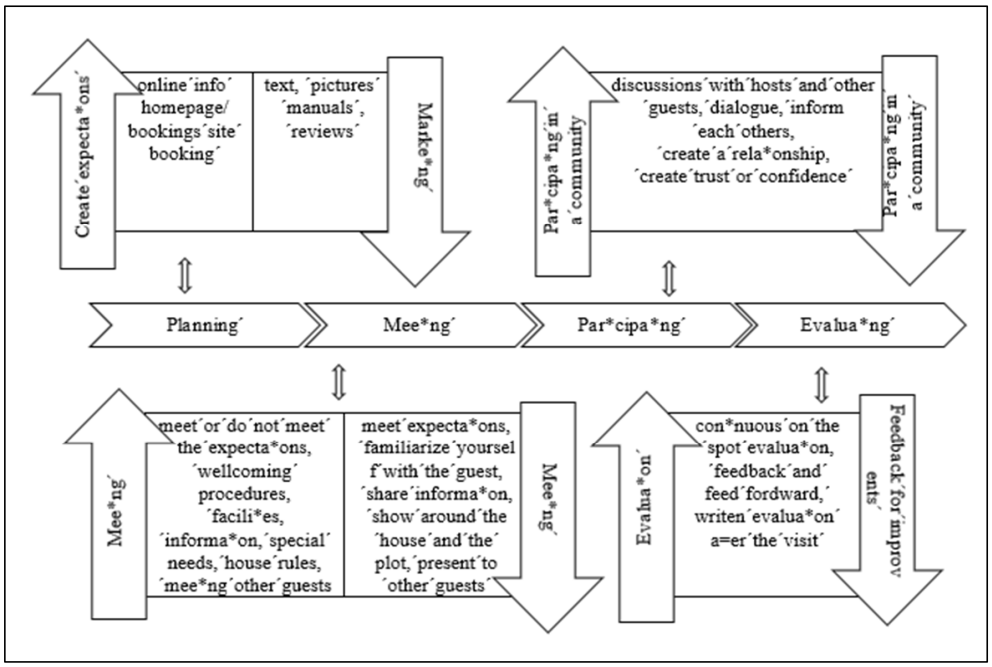

Figure 1 – Encounters

4.2 Planning – to Create Expectations

There were different reasons to visit the island among visitors. Some of them, mostly foreign visitors, had heard or had read about the island in some guidebooks, such as Lonely Planet. Others had got hints from their friends who already had visited the island. Many of couples mentioned that it was to seek some tranquillity and nature experiences as a contrast to city tourism when making their choice of visiting the island and this specific accommodation. The information offered about the island in advance was accurate and corresponded quite well the experiences visitors had of the island. Furthermore, the couple's expectations were well corresponding with their experiences of the visit: Service, at the restaurants, tours, museums etc. organized and offered for the visitors, was in general experienced as very satisfactory:

Generally good, but Visby is too touristic and stressful, some of the younger waiters and service people were less service minded.

The attractions on the island received also good reviews from the visitors. There were couples that wished some more bicycle lanes, though. One couple was pleased with the number of different attractions on such a limited area.

The first thing visitors do in order to start their processes of visiting the resort is to plan their trip. Usually to book the tickets for the trip and then book the accommodations needed. As it seems to be the case today, it's often alternative forms of accommodations which are preferred while people are travelling.

In order to plan the trip, visitors use online services consisting of homepages and booking sites. While planning their stay visitors look the different and wide spectra of offering accommodation possibilities on Gotland. Already here, at the start, they do begin the process of creating values for the whole trip. By sorting the object, they really select something due to the different parameters after their needs, expectations and economical resources. Below some statements presented from the guests.

We are so happy; our room was exactly like in the pictures.

But not all of the couples were as satisfied:

The nature is such wonderful but the town Visby did not met our expectations.

Hosts, in turn, offers symbols for visitors' selections by designing their homepages and booking sites with pictures and images, creating expectations or disexpectations. Information, text and pictures are short advertisements over eventually upcoming accommodation. These can both attract or deter the customer. This process can be seen as a part of marketing.

4.3 Meeting

In the physical meeting, visitors confirm or must reject their expectations. This is a multi-level meeting: The guests can experience the house as it turns out in

reality by meeting their hosts, by familiarizing with the room and the rest of the house and it's surroundings. They also get acquainted with other guests. Information exchange about house rules do take place; preliminary information about the surroundings, local history, nearest grocery store, restaurants and public transportation are issues discussed within this first contact.

The BnB providers meet the guests with their different questions and give some standardized information on the house and surroundings. This physical meeting enables both parties to confirm their expectations.

The host can also have the first opportunity to evaluate the guest's satisfaction with the room and the facility. Hosts can also discover guests' special requests, plans for the nearest days and excursions.

The first experience of the house was very bad. We didn't get the room we had hoped for.

4.4 Participation – Creating Relationship

While the guests have installed themselves in the house, a process of participation in the daily life of the house begins, participation in the Community, its' people and routines. Not every guest wishes to participate the community. Some of them, though, are limiting their social participation to the curtesy against hosts and other guests and prefer withdrawing from the community. But it's more common among the BnB guests being active and willing to participate in the company of others, according to the hosts. To participate means, in this study, that hosts and guests find occasions to discuss different matters with each other's in order to create a relationship by dialogue. Such occasions are offered around breakfast time, within other meals and within other kinds of unscheduled meetings in the house or in the garden. In these discussions, different issues are reasoned and dealt with. The guests are telling about their experiences from their daytrips consisting many different activities. The host are giving their local picture of matters and dealing hints and advices over the visiting objects. All in all, they are learning from each other's and can create value to their visit in this way. While changing their experiences they are creating relationship built on trust and confidence into each other's.

During the breakfast, we talked to the hosts and other guests about our plans on the trip, our lives back home, our children, matters of sustainability etc.

4.5 Evaluation

Evaluating is an ongoing process between the guests and the hosts. This process does already start while planning the trip and planning to welcome the guests. It continues at arrival by guests contrasting their expectations with the physical environment and the accommodation itself, the hosts and the other guests. This evaluation takes place throughout the trip and the stay on the accommodation as well as after the visit in the form of an evaluation carried out digitally in this BnB

accommodation. The same process is being reviewed by the hosts. In these surveys, the guests are pointing out values being added to their stay by taking up issues like comfort, space, cleanliness, resources and amenities they could share at BnB home. Such as Wi-Fi, kitchen facilities, coffee machine etc. Also, ability to cook their meals, ability to buy the meals, ability to share and spent time in the garden with the hosts and other guests were mentioned as a value-creating issues. Socializing with other guests were mentioned as something positive and valuable. Staying with their own pet on the accommodation were also reported as a value-adding dimension.

We were having interesting discussions with our hosts and co-guests about water shortage and other issues of sustainability on the island.

To sum up the presentation of encounters above, they can also be understood and explained through the three phases of sensemaking process expressed by Weick (1995). Namely awakening, interpretation, building intersubjective meanings and creating a cognitive map, and action. In the following the sensemaking process with the seven known and thought-based qualities of the process by Weick, the features are analysed.

4.6 Analysing Properties of Sensemaking

Sensemaking is grounded in identity construction. Weick identified seven properties of sensemaking (Weick, 1995). Identity and identification is central – who people think they are in their context shapes what they enact and how they interpret events (Currie and Brown, 2003; Weick, Sutcliffe and Obstfeld, 2005; Thurlow and Helms Mills, 2009). An individual understands the matter or the phenomenon only when he has spoken up her thoughts. An individual does not form her identity in a vacuum, but it is shaped by social relations (Weick, 1995). An individual learns to understand who she really is by looking upon herself through others. Based on the empirical evidence of this study, the choice of holiday is made, to a certain extent, to strengthen the self-image of the visitors. Destinations, accommodation, excursion goals, etc. are chosen to reflect the self-image, consciously or unconsciously.

The house was full of antiques and travel memories from around the world. It created a harmony for our stay.

To summarize this section, it can be argued that there seems to be a connection between the chosen type of accommodation and visitors' self-image or part of identity. Yet, there is a connection between the hosts' way of designing their home, the BnB accommodation, and their identity.

4.7 Sensemaking Based on A Review of The Past

By looking retrospectively backwards, people learn through their experiences and can move their learning into future activities (Weick 1995; Weick, Sutcliffe and Obstfeld, 2005). This can still be time-oriented for both the past, present and

future according to some researchers (e.g. Gephart, Topal and Zhang, 2010). Because our perceptions of the future are always based on the present and the past. According to these ideas, the sensemaking takes place and does not have a temporal beginning or end. Guests tell about their experiences regarding visitor destinations, service etc. and compare their past experiences to today's experiences. But they also make suggestions for improvement on various issues they have experienced.

Routes for walking and biking have to be improved. At the same time, Visby it's also clearly getting swamped every summer with thousands of people.

4.8 Enactment

Sensemaking shows the mutual sensitivity of cognition and activity to the environment. Sensemaking is the synthesis of cognition and activity (Weick, 1995). Weick (1988, 1995; Weick, Sutcliffe and Obstfeld, 2005) refers to the word enactment, which means the involvement of people in the creation of their environment. The guests are discussing with each other's and with the hosts during the different occasion of their visits. These discussions varies all from places to visit, environmental sustainability issues on the island, politics and private family matters.

Our hosts discuss with us all kind of matters and gave us valuable advices on life, divorces, sustainability etc.

4.9 Sensemaking is Social

The process of sensemaking is basically social. It's going on in interaction with the various guests of the accommodation. The social nature of sensemaking becomes visible when guests of the accommodation interpret their environment in interaction with other guests and construct explanations that help them to understand the reality and to act collectively (Weick, Sutcliffe and Obstfeld, 2005). Creation of meaningfulness requires shared meanings (Weick, 1995).

Due the visitors' statements, they share same kind of experiences with other guests by visiting often same attractions. This, in turn, gives possibilities to talk over more profound about what they have been experiencing during the visits.

4.10 Hints as Triggers

The hints (extract cues) from the environment seem to fit well with the previously experienced experiences of the guests. They can interpret them even though the things' ambiguous nature. Guests filters also all the time the flow of information around them and chooses pieces fitting into their own structure of significance. In discussions at the BnB some hints (e.g. where to go, what to see) are highlighted, and on the other hand, some others never come into focus.

Some other guests at the BnB told us about the nice pottery, which we then

visited.

4.11 Sensemaking as an Ongoing Process

When guests at the accommodation react to the environment and shape it with the help of cognition and social actions, one can talk about the continuing nature of sensemaking. Sensemaking has then neither the beginning nor the end because meaningfulness takes place at all time in the continuous flow of events (Weick, 1995). Guests always try to understand what is happening around them. This shows how guests and hosts take part in this process already in initial phases: planning the trip as a guest or marketing the establishment as a host.

4.12 Sensemaking Based More on Plausibility than on Accuracy

Continuous change in information flow makes accuracy meaningless for the guests. In order to be able to transform information into their own understanding, there is a need of plausible explanations. These can be other guests' and hosts' subjective experiences as well as guidebook texts and other informants. This information has to bee then inserted with their own and earlier experiences, in order to make sense. Sensemaking is both individual and collective activity (Weick, 1995). It is an individual and collective process simultaneously. Above it has been described how Karl Weick constructs the nature of the sensemaking process based on seven characteristics. According to Weick (1995), they define the sensemaking process and make it possible to understand why any situation, activity or phenomenon is shaped as it is formed and why people give different meanings to the same thing. Research literature utilizes the features of the sensemaking process created by Weick, although the evidence of the appearance of properties and the relationships between them is rather limited. Probst (2012) and Lunkka, Suhonen and Turkki (2015) have shown that the seven determinants of the Weick's sensemaking process are still useful and also relevant.

5 CONCLUSIONS

This research aimed to create new knowledge about the processes involved in the co-creation of values between providers and their guests at one single BnB accommodation on the island of Gotland in Sweden. The interplay between these two actors can be seen as a platform or arena for value-creation. The stay and the interaction with the hosts do not only create value for the accommodating itself but also for whole trip for the visitors. The hosts can be seen as co-producers of values. This value-creation process includes several other processes, so-called encounters.

In this study, the encounters are to be seen as supporting processes to the main process of co-creation of values. With the help of these supporting processes both parties create meaning for the visits. Sensemaking is a collective process which seem to take place simultaneously with individual process of meaning-making.

In this study, the focus has been on sensemaking as a process which gives meaning to our collective experiences. In order to understand the process of co-creating values, this study has used Weick's seven determinants for sensemaking. With the help of the figure below, Fig. 2, the process of co-creation of values is described.

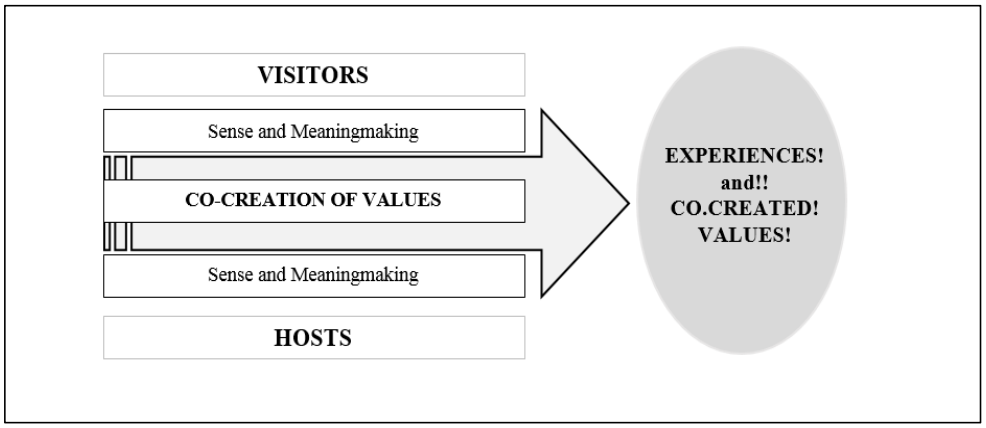

Figure 2 – Process of Co-creation of Values

Co-creation of values can be comprehended as both individual and social construction of values. Encounters can be regarded as supporting processes within the main process of value creation. Value-creation is an ongoing process from planning the trip to evaluation of it. This process is procedural, but it is not necessarily linear. Encounters or supporting processes can be described as phases or arenas to create interaction between the actors. On these arenas, the guests create values through sensemaking processes for the whole journey. Then BnB accommodation can be seen as generator for this process. This type of accommodating hospitality gives guests easier possibilities to share their experiences with the hosts and other guests. The hosts, in turn, get immediate confirmation or feedback on their recommendations. This helps the host to develop their business and sharpen their advice on local attractions. Social interaction between guests and hosts creates comfort and homeliness. Discussion with other guests and hosts are more informal for their character. This can be compared against the more formal knowledge in guidebooks and brochures.

The process of co-creation seems to be an important part of our identity and it strengthens it in many ways. Guests are looking for accommodations that fit into their identity, which they consider themselves to represent. Choosing a small, family-run BnB rather than a large hotel allows one to be both seen and acknowledged as a person. This enables for some kind of revision of the self-image. This, in turn, creates value for the trip. Choosing to stay on a BnB has become more and more common among visitors worldwide. It is therefore important to create knowledge about how this type of accommodation creates value for visitors. Staying at the BnB seems to be a more complex social

environment than staying at the hotel. This creates greater demands on both hosts and guests. Requirements for social interaction increased knowledge of the local community, it's culture, sights, history, activities and, not least, issues of sustainable tourism. This is, if possible, even more, important knowledge for visit organizers, accommodation suppliers and hosts. Maybe it is important to provide training for the hosts; to enable them to be active players in the creation of sustainable local tourism through social construction.

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Application of SPC in Short Run and Small Mixed Batch Production: Case of Bakery Equipment Producer

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ABSTRACT

Purpose: The purpose of this paper is to present preliminary research in statistical process control (SPC) of short run and small mixed batches (SR-SMB) at the organization producing bakery equipment.

Methodology/Approach: The starting point of the research is a literary survey of possibilities of using SPC for SR-SMB and analysis of the current state of production in a particular organization. Through Pareto analysis, verifying the normality of the data obtained during eleven months, calculation of process capability and performance it was possible to prepare control charts. Finally, the single-case study shows that the proposed control charts are applicable in a small batch and mixed production in the organization producing bakery equipment.

Findings: Through SPC implementation in bakery equipment SR-SMB production it is possible to understand the behaviour of the process and to organize better and control the production of expensive precision components.

Research Limitation/implication: Limitation of the research is that data have not been reviewed by individual machines and the impact of individual machines and their settings is not displayed separately.

Originality/Value of paper: Using SPC in the bakery equipment industry is far from common practice. The article presents the first part of the research, which is the starting point for more detailed analysis needed to optimize the use of materials, energy and environmental consequences.

Category: Case study

Keywords: bakery equipment; control chart; short run; small mixed batch; SPC; X_i diagram; mR diagram; $\overline{X}$, R diagram; Hotelling T2 diagram

1 INTRODUCTION

The competitive pressure on the continuous improvement of organizations' performance in the current, ever-changing environment is very high. The business environment increases the need for versatility and flexibility of production in highly efficient production systems. These systems do not need to have material on stock but require products, respectively their components, to receive and deliver "just-in-time" in "Lean" organizations (Brännmark et al., 2012).

Therefore, organizations must be able to produce a broader range of products in smaller batches and shorter production cycles. Production systems need to be flexible, ready for adjustments, prepared to change, and change the changes.

The opportunity for research is in a less explored and literally-documented field that focuses on short-run (SR) processes and small mixed batches (SMB) in the bakery equipment industry. This industry is characterized by its high requirements for material safety and precision components and products.

Consequently, the implementation of statistical process control (SPC) must focus on critical manufacturing processes of such products.

The presented research is going through preparation for the dissertation thesis and is divided into several phases. In the first phase, the current state of the organization was examined regarding production organization and production control, quality assurance and conceptual research framework according to (Juhászová and Zgodavová, 2017; Juhászová and Čička, 2018). The second phase aimed at problem definition and determining performance metrics. The third, analytical phase presented in this article, after identification, validation and selecting the causes using Pareto analysis aims to create control charts for SR-SMB SPC.

Phases of improvement and design of a new management method will be gradually solved in the next stage of research.

2 RESEARCH PROBLEM AND OBJECTIVES

Products that are generated by one or more similar processes are usually considered as different entities. As a result, organizations often focus on the product and analyze the sources of process changes. Due to the fact, that in short production cycles with a small number of identical products it is not possible to obtain sufficient information for management (quality management, logistics or financial management), it is necessary to focus on the common element, and that is the process itself.

Based on best practices for the application of control charts for processes with long production cycles and a single product characteristic, it is generally recommended that at least 25 subgroups of data be gathered, and these data can

be used to create the basis for the control chart (ISO, 2017). In the case of small mixed batch production, many subgroups cannot be created and therefore processes need to be grouped in a predetermined way.

The goal of this research phase is to use Lean Six Sigma analytical tools for taking decisions in the bakery equipment organization about pros and cons of introducing SPC in a small batch and mixed production and to testing it under specific conditions. Control charts for univariate measurement processes were presented in (Juhászová and Zgodavová, 2017; Juhászová and Čička, 2018). Therefore only short summaries will be given in this paper. Control charts for multivariate will be described in detail.

3 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Bakery production lines and equipment are based on the customer's requirements for the final product, which is the bakery dough. Equipment that prepares and modifies the dough is called bread and rolls equipment, dough processing equipment, pizza product equipment. Production of such equipment represents a precision engineering, in some cases, it is a mechatronic production that meets strict standards to produce equipment used in the food industry. Components that come into direct contact with the dough are made of high-quality stainless steel and food grade material.

Research in the field of short run and small mixed batches was in the past mainly focused on products and less on processes, so SPC implementation was related mainly to products. In literary sources and professional practice, by the end of the last century most of the terms "piece production" and "small batch production" were used and were mainly characterized by the number of pieces produced in a batch (Zgodavová, 1995). Examples are in publications (Cullen, 1987; Nuget, 1990) where the following terms can be found: "one-off and small batch production" and (Zgodavová, 1995) "small batch and piece production".

Nowadays, when there are a growing need for the possibility of modifying production according to individual specifications and customer preferences and "Lean" (Brännmark et al., 2012; Jarošová and Noskievičová, 2015) and "Agile Manufacturing" (Lee and Lau, 1999) paradigms, organizations need to focus on SPC to improve processes. This leads to the need to better characterize such production based on cycle time (Tošenovský, 2010) and control time (Zgodavová, 1995) to identify planned and actual production time about a certain number of pieces produced and to provide corrective actions.

According to ISO 7870-8 (2017), the term "short run" (SR) means that only a few pieces are produced, and consequently a different part or item (characteristic) is going will be produced. It means that the production cycle is very short, the repeatability of the production batch is low, and a very small volume of items is in a batch.

The term "small mixed batch" is used when different products are in the batch, but according to some characteristics they can be investigated together (Zgodavová, 1995).

Based on a more detailed survey (ISO, 2017; Zgodavová, 1995; Cullen, 1987; Jarošová and Noskievičová, 2015; Foster, 1988) for short production cycles and small mixed batches, the following situations can be considered: (a) a small quantity of the same product in a batch; (b) one production process is used when producing different products; (c) several operators use the same machines or devices; (d) lack of parts in one production process to create and maintain process control limits; (e) it is not possible to obtain sufficient data due to a short production cycle; (f) a large volume of different parts are produced for several different customers.

SPC techniques are applicable in any short-run production in small mixed batches, which are repeatable in any way.

The procedure of identifying and grouping similar characteristics and, if necessary, its modifications can be described according to (ISO, 2017), in three steps:

Step 1: Identification of processes → Formalization of processes → Determination and evaluation of influencing characteristics.

Step 2: Expert knowledge or analysis of existing data → Identification of systematic process influencing → Groping of characteristics.

Step 3: Use of control charts → Periodic and alarm triggered check of the group → Systematic influences → In case of a systematic impact, return to step 2.

Multiple processes can be grouped when the same procedure follows them but with different characteristics such as nominal/target value, tolerance, material, measurement process, production machine, tool, environmental conditions, etc. Characteristics that differ between processes are plotted in the cause and effect diagram together with the appropriate parameter.

If there are no significant differences or these differences are systematic, they can be compensated by transforming the values into a single scale. Then, the characteristics can be grouped, and a standard control chart can be used.

During the application of control charts, a number of data is collected, and an amount of knowledge is acquired about processes. Therefore, it is necessary to regularly verify that the terms of data grouping are still valid. This is particularly true when there are warning signs for which no attributable cause can be found. To flexibly group and reorganize processes, it is essential to record characteristics such as meta-data along with the measured data so that each measured value is associated with a group of processes.

The theoretical framework presented in this paper is about selected tools of Six Sigma, which will be used for analysis in a particular organization producing

bakery equipment: (1) Normality test; (2) Homogeneity of variances; (3) Measurement Systems Analysis (MSA); (4) Control charts for short run and small mixed batch processes:X_i, mR; $\bar{X}, R$control charts for univariate data; and multivariate Hotelling T-square (T2) control chart for multivariate data using QI Macros SPC Software for Excel (QI-Macros, 2018).

4 CASE STUDY

The company where the research was conducted specializes in developing and delivering innovative solutions for the bakery industry.

The organization has its quality assurance system, which is not ISO 9001 certified. The main products of the company are shafts, rollers, electro-cabinets, hoppers and conveyors, which are assembled to dough processing units, dough thickness reducing units, shaping or dosing units. Almost every project has specific customer requirements and is a so-called "turn-key" solution. Repeatability of production is very low (5 pieces of products are considered to be series), and this predetermines high degree of detail of construction and technological preparation of production as well as the scope of work related to the development of the technological process.

Frequent changes and workplace adjustments place increased demands on time consumption, and work interruptions, high level of work-in-progress is present, and so is an uneven use of production facilities. The following components are included in the overall research: tube, shaft, flange and roller (400; 600, 800) made of AISI 304 DIN 1.4301. The manufacturing process is as follows:

(1) Cutting raw material in cutting room (vertical separation of seamless tubes to exact length, cutting of round bars).

(2) Advance preparation of individual parts of the roller on lathe machine (flanges, tube, and shaft), axial alignment and turning diameters.

(3) Welding flanges to the shaft, welding tube to the shaft with flanges.

(4) Turning individual shaft diameters, roller diameter concerning the required roughness, circular and total runout tolerances, and straightness (form tolerance).

(5) Milling shaft keyways and shaft threads. Incoming inspection is not performed as a raw material is purchased from certified vendors with an attestation.

Only post-operational control is in place in the plant. Technical Control Department does measurements of selected characteristics of the final products.

The management of the organization has decided to explore the possibilities of optimizing production regarding time consumption, work interruptions, reducing

the number of work-in-progress processes, use of production facilities and SPC implementation.

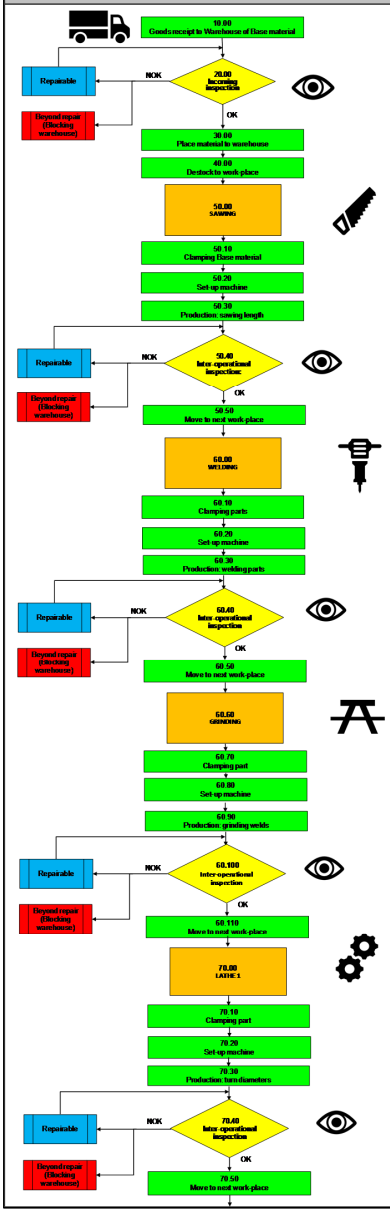
Precise bakery equipment process work flow is described in Fig. 1 and Fig. 2.

Process Flow

Project 10000050772 | Supplier

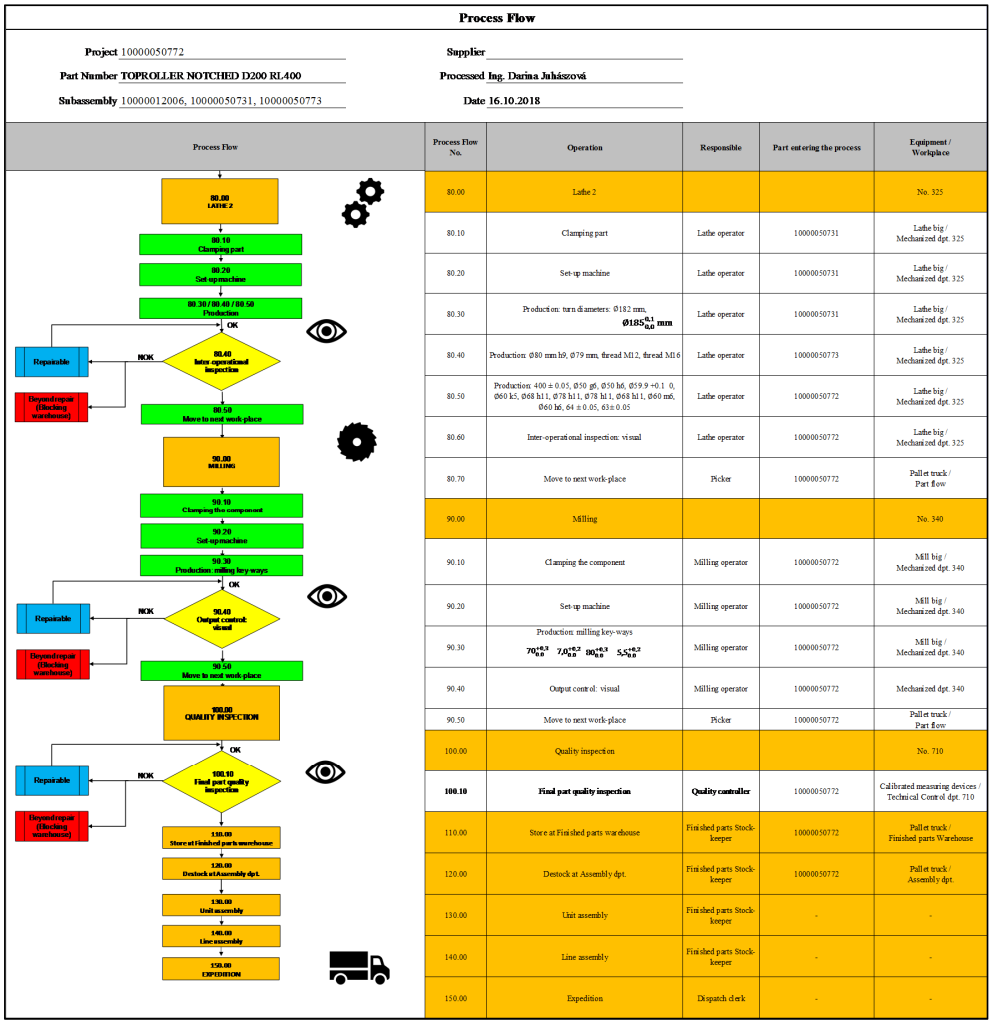
Part Number TOPROLLER NOTCHED D200 RL400 | Processed Ing. Darina Juhászová

Subassembly 10000012006, 10000050731, 10000050773 | Date 16.10.2018



Process Flow No.	Operation	Responsible	Part entering the process	Equipment / Workplace
10.00	Goods receipt to warehouse	Base material Stock-keeper	Base material AISI 304 DIN 1.4301	Pallet truck / Warehouse of Base material
20.00	Incoming inspection: visual	Base material Stock-keeper	Base material AISI 304 DIN 1.4301	Pallet truck / Warehouse of Base material
30.00	Place material to warehouse	Base material Stock-keeper	Base material AISI 304 DIN 1.4301	Pallet truck / Warehouse of Base material
40.00	Destock to work-place: Sawing dpt.	Base material Stock-keeper	Base material AISI 304 DIN 1.4301	Pallet truck / Material flow
50.00	Sawing			No. 220
50.10	Clamping Base material	Sawing operator	Base material AISI 304 DIN 1.4301	Precision saw for Stainless steel / Sawing dpt. 220
50.20	Set-up machine	Sawing operator	Base material AISI 304 DIN 1.4301	Precision saw for Stainless steel / Sawing dpt. 220
50.30	Production: sawing length 404 mm ± 0.05 mm	Sawing operator	10000050731	Precision saw for Stainless steel / Sawing dpt. 220
50.40	Inter-operational inspection: visual	Sawing operator	10000050731	Sawing dpt. 220
50.50	Move to next work-place	Picker	10000050731	Pallet truck / Material flow
60.00	Welding			No. 240
60.10	Clamping parts	Welder	10000012006 10000050731 10000050773	Mould / Welding boot 240
60.20	Set-up machine	Welder	10000012006 10000050731 10000050773	Mould / Welding boot 240
60.30	Production: welding	Welder	10000012006 10000050731 10000050773	Mould / Welding boot 240
60.40	Inter-operational inspection: visual	Welder	10000050772	Welding boot 240
60.50	Move to next work-place	Picker	10000050772	Pallet truck / Part flow
60.60	Grinding			No. 270
60.70	Clamping part	Grinder	10000050772	Mould / Grinding dpt. 270
60.80	Set-up machine	Grinder	10000050772	Grinding machine / Grinding dpt. 270
60.90	Production: grinding welds	Grinder	10000050772	Grinding machine / Grinding dpt. 270
60.100	Inter-operational inspection: visual	Welder	10000050772	Grinding dpt. 270
60.110	Move to next work-place	Picker	10000050772	Pallet truck / Part flow
70.00	Lathe 1			No. 310
70.10	Clamping part	Lathe operator	10000012006	Lathe small / Mechanized dpt. 310
70.20	Set-up machine	Lathe operator	10000012006	Lathe small / Mechanized dpt. 310
70.30	Production: turn diameters $\phi 300^{0.2}_{0.1}$ mm, Ø181 mm, Ø88 mm $\phi 185^{0.0}_{0.1}$ mm	Lathe operator	10000012006	Lathe small / Mechanized dpt. 310
70.40	Inter-operational inspection: visual	Lathe operator	10000012006	Mechanized dpt. 310
70.50	Move to next work-place	Picker	10000012006	Pallet truck / Part flow

Figure 1 – Process Flow Chart for Production Stainless Steel Roller



Process Flow No.	Operation	Responsible	Part entering the process	Equipment / Workplace
80.00	Lathe 2			No. 325
80.10	Clamping part	Lathe operator	10000050731	Lathe big / Mechanized dpt. 325
80.20	Set-up machine	Lathe operator	10000050731	Lathe big / Mechanized dpt. 325
80.30	Production: turn diameters: Ø182 mm, $Ø185^{0,1}_{0,0}$ mm	Lathe operator	10000050731	Lathe big / Mechanized dpt. 325
80.40	Production: Ø80 mm h9, Ø79 mm, thread M12, thread M16	Lathe operator	10000050773	Lathe big / Mechanized dpt. 325
80.50	Production: 400 ± 0.05, Ø50 g6, Ø50 h6, Ø59.9 +0.1 0, Ø60 k5, Ø68 h11, Ø78 h11, Ø78 h11, Ø68 h11, Ø60 m6, Ø60 h6, 64 ± 0.05, 63±0.05	Lathe operator	10000050772	Lathe big / Mechanized dpt. 325
80.60	Inter-operational inspection: visual	Lathe operator	10000050772	Lathe big / Mechanized dpt. 325
80.70	Move to next work-place	Picker	10000050772	Pallet truck / Part flow
90.00	Milling			No. 340
90.10	Clamping the component	Milling operator	10000050772	Mill big / Mechanized dpt. 340
90.20	Set-up machine	Milling operator	10000050772	Mill big / Mechanized dpt. 340
90.30	Production: milling key-ways $70^{+0,3}_{0,0}$ $7,0^{+0,2}_{0,0}$ $\emptyset 8^{+0,3}_{0,0}$ $5,5^{+0,2}_{0,0}$	Milling operator	10000050772	Mill big / Mechanized dpt. 340
90.40	Output control: visual	Milling operator	10000050772	Mechanized dpt. 340
90.50	Move to next work-place	Picker	10000050772	Pallet truck / Part flow
100.00	Quality inspection			No. 710
100.10	**Final part quality inspection**	**Quality controller**	10000050772	Calibrated measuring devices / Technical Control dpt. 710
110.00	Store at Finished parts warehouse	Finished parts Stock-keeper	10000050772	Pallet truck / Finished parts Warehouse
120.00	Destock at Assembly dpt.	Finished parts Stock-keeper	10000050772	Pallet truck / Assembly dpt.
130.00	Unit assembly	Finished parts Stock-keeper	-	-
140.00	Line assembly	Finished parts Stock-keeper	-	-
150.00	Expedition	Dispatch clerk	-	-

Figure 2 – Process Flow Chart for Stainless Steel Roller – Continuation

4.1 Preparation for SPC Implementation

Before the SPC implementation, it was necessary to identify processes and monitored variables. Processes: cutting raw material, lathe operation.

Observed variables: tube length (tolerance ±0.05); precise shaft diameter (ϕ50 h6); total runout (0.05 mm) and straightness (0.05 mm). Furthermore, it was necessary to ensure the conditions for SPC, i.e. steadiness of all known effects: temperature in the range of 16ºC – 20ºC; air humidity 50% - 60%, and material quality according to DIN 1.4301 (AISI 304) austenitic chrome-nickel steel.

Subsequently, MSA was performed, while all measurements were made by calibrated measuring devices and by experienced and trained personnel of the Technical Control department. Measurement system analysis processed in (QI-

Macros, 2018) showed that the influence of the measurement process is less than 10%.

Period of data collection is January 2017 – November 2017. A number of tube length measurements is 50. A number of diameter measurements: 150, with a range of subgroup 3 and the number of subgroups are 50. In the case study, the summaries of the short run and small mixed batch control charts applications are present:

- X_i, mR control chart for cutting precise tube length (404±0.05, 604±0.05, 804±0.05);
- $\bar{X}, R$ for measuring precise shaft diameter (ϕ50 h6).

Hotelling T2 control chart for a mutual combination values for straightness and total runout (0.050 mm and 0.050 mm).

4.2 Control Chart X_i, mR

Cutting (vertical separation) of three types of stainless steel tubes to exact length (Tab. 1) was monitored for eleven months. Fifty data were obtained which, after clustering and transformation to a single scale, were recorded in *Xi*, control chart (Fig. 3) and *mR* control chart Fig. 4. The tubes vary in length; their common sign is material and tolerance. Data originates from a normal distribution processed in (QI-Macros, 2018).

Table 1 – Dimensions of 3 Types of Monitored Rollers

Rollertype	**Shaft length**[mm]	**Tube diameter**[mm]	**Tube length**[mm]
400	941	182	404 ± 0.05
600	1,141	182	604 ± 0.05
800	1,341	160	804 ± 0.05

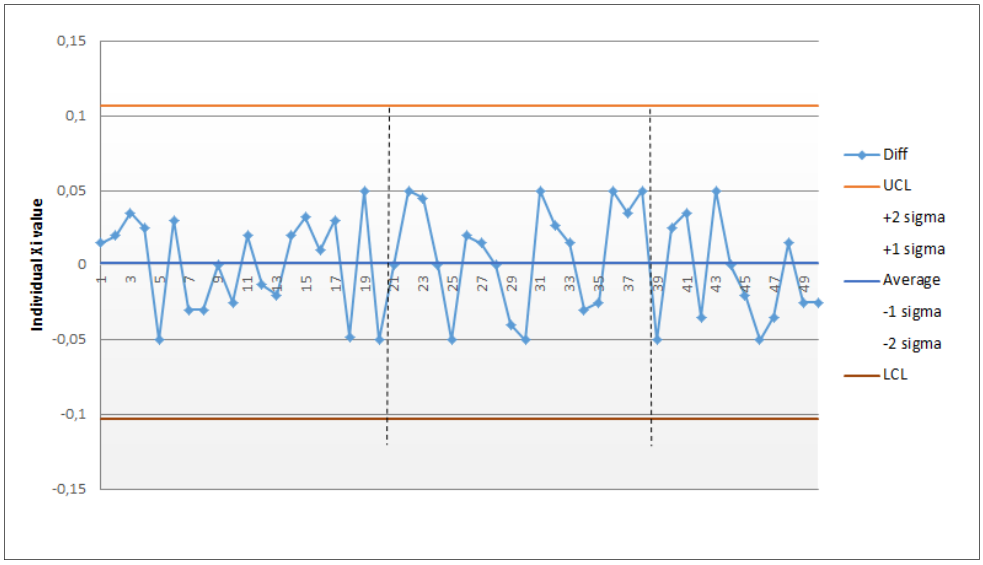


Figure 3 – Control Chart for Transformed Individual Values X_i, mR for the Process of Vertical Steel Cutting

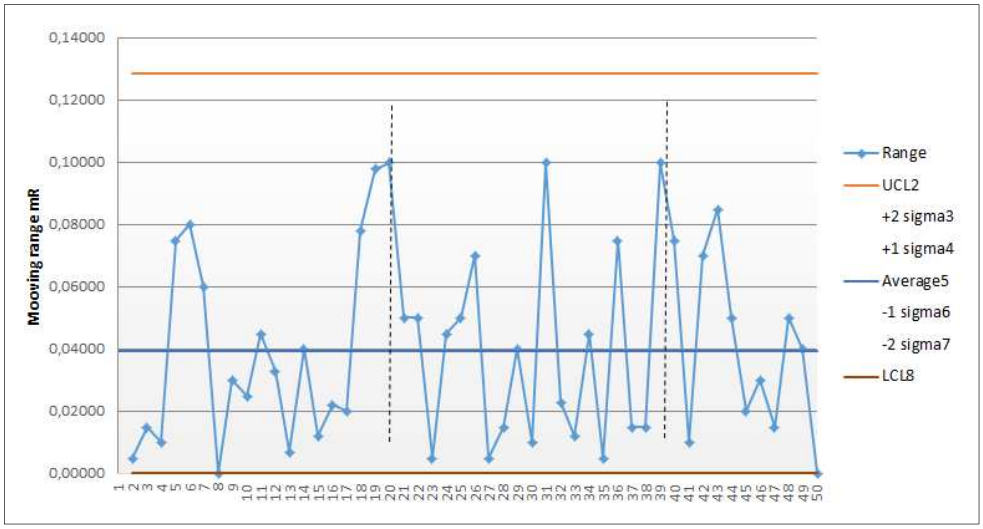


Figure 4 – Control Chart for Moving Range mR For the Process of Vertical Steel Cutting

Summary: *Data in a control chart for individual values X_i, mR are centered, located within the control zone, and deviating measurements were not detected.*

In the moving range chart, *mR* has used ranges between consecutive values. The control zone was not exceeded. The process is stable.

4.3 Control Chart $\bar{X}, R$

Lathe operation of stainless steel roller diameters has been monitored for 11 months. Overall 150 data were gathered and grouped into 50 selections, each of which contained 3 pieces. The data were recorded in $\bar{X}, R$ control chart (Fig. 5). The rolls vary in length and tube diameter. Their common sign is material and shaft diameter $\phi 50\ h6$.

Standard probability plot processed in (QI-Macros, 2018) shows that the data are from a normal distribution.

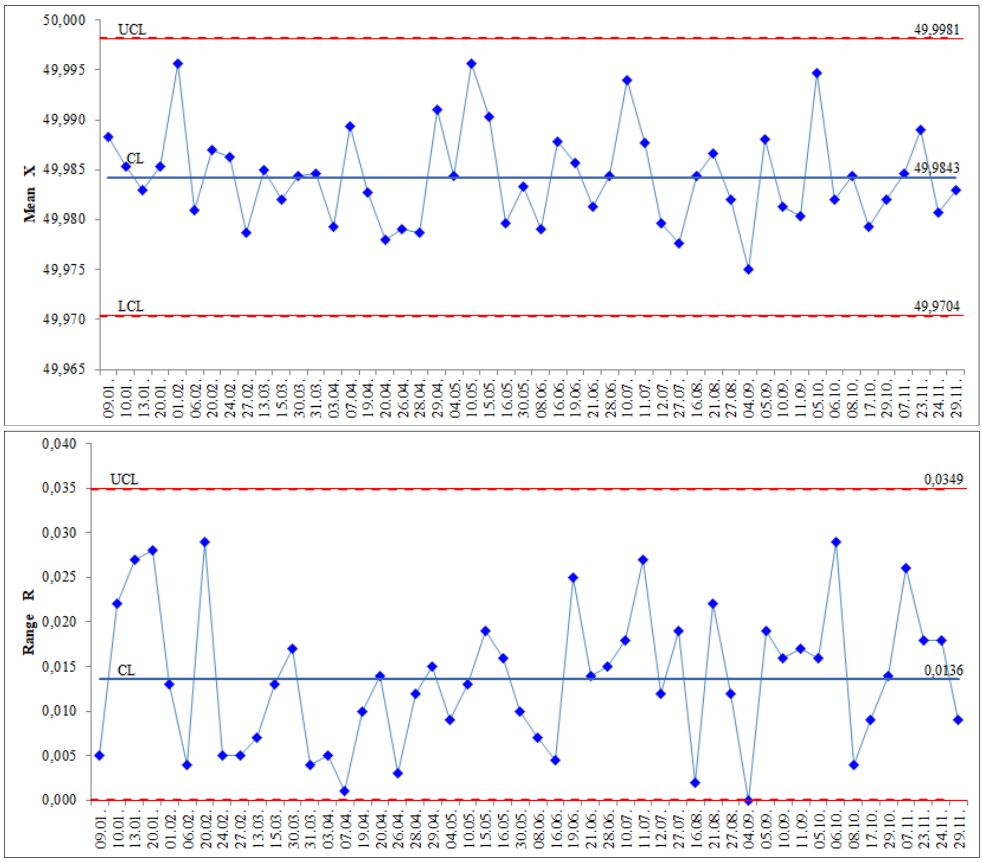


Figure 5 – Control Chart $\bar{X}, R$ for the Process of Precise Shaft Diameter Φ50 h6

Summary: *Through $\bar{X}, R$ it has been verified that production of all three types of rollers (400, 600 and 800 mm) is considered as statistically under control, all values of monitored characteristics are within the control limits.*

4.4 Hotelling T2 Control Chart

Similar to the X_i, mR chart, the Hotelling T2 chart evaluates the covariances of the ranges between each of the two measures and the covariances of the actual data points.

For the mutual combination of values, preliminarily[1] the results from measurements of straightness and total runout were recorded in the Hotelling T2 control chart (Fig. 6, Fig. 7). Standard probability plot processed in (QI-Macros, 2018) shows that the data are from a normal distribution.

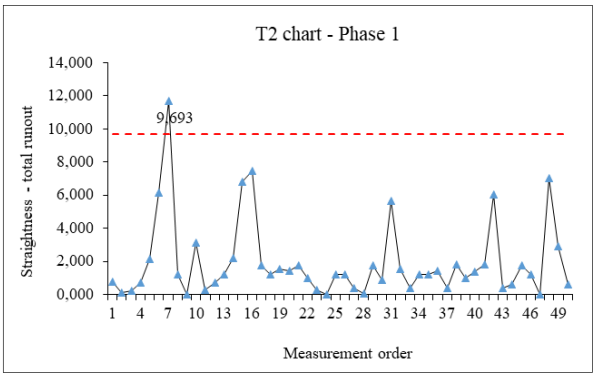


Figure 6 – Phase 1 Hotelling T2 Control Chart

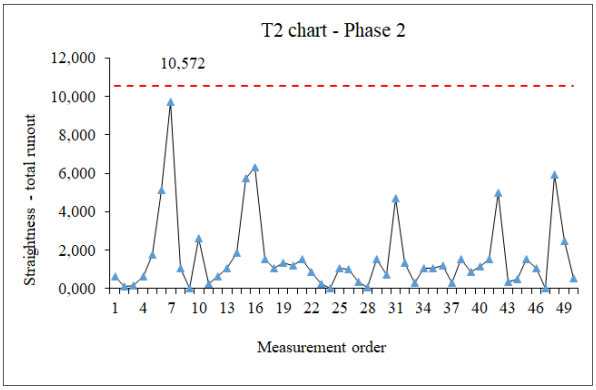


Figure 7 – Phase 2 Hotelling T2 Control Chart

Summary: *The 1st chart (Phase 1) shows an outlying measurement, which was detected as measurement No. 7. The measured value of straightness and total runout is higher than the specification limit (0.071 mm – 0.065 mm towards 0.050 mm – 0.050 mm).*

[1] because further measurements are not yet available.

5 CONCLUSION

Research in the area of short run and small mixed batches production is based on a preliminary literature review and focuses on preparing the implementation of the SPC in an organization producing bakery equipment. As part of this preparatory phase of the SPC, the process of cutting and lathe operations were monitored. $\bar{X}, R$; X_i, mR and Hotelling T2 shows that both processes are stable, but according to the Hoteling T2 control chart and the reports of experienced operators, it can be assumed that the processes are significantly affected by characteristics of the current machine state, by set-up the machines, and of what level experiences have operators.

Future research opportunity we see in the continuation of the measurements so that the same number of measurements is ensured for both separately monitored processes. Data transformation into a single scale, more detail use of Hotelling statistics, inspection of downtimes, searching for possibilities to reduce production completeness (work-in-progress) and optimizing the use of production facilities using Lean Six Sigma tools.

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Innovative Approach to Education Improvement via Enterprise-Education Collaboration

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ABSTRACT

Purpose: The enterprise-education collaboration is a win-win situation. This paper describes how should be used commonly used LMS for enrichment the education process by collaboration students with companies participating on company's practical problems.

Methodology/Approach: We began with a review of literature and official European documents concerned on Europe 2020 strategy, education innovation and analysis of shortcomings of higher education graduates' skills that are required by companies acting on the labour market. Then was applied pilot test and case study approach to evaluate the usability of designed SP4CE platform.

Findings: Within the paper, we identified most missing skills of newly employed graduated, tested the developed SP4CE platform and find out that using this tool is supportive on the development of skills mainly required by employers.

Research Limitation/implication: The results of pilot tests and single case study as a research strategy cannot be generalised as universal recommendations for any educational needs. It is important to involve into the platform and its functionality, sustainability assessment for more enterprises and not only collaboration effects but also impact of organizational and personal factors need to be evaluated.

Originality/Value of paper: The paper presents an innovative approach to enterprise-education collaboration and its benefits not only to directly concerned participants but also its impact to whole society.

Category: Case study

Keywords: labour market; HR development; collaborative learning; education innovation

1 INTRODUCTION

Globalization, demographic changes (like migration to cities, the ageing population, and the shifts in family size and social norms) and technological changes most influence the Europe's knowledge system. New technologies appear in very fast pace and changes our everyday lives, and significantly influence the way we live. To stay competitive, it seems to be crucial to have an effective education system able to respond dynamically to changes in the company and the labour market (Šafránková and Šikýř, 2016).

As is stated in (European Commission, 2015), there is a need for new skills, new capacity to cope with rapid changes for whole human life. Higher education plays important role in the growth of human capital and creation of a better educated, more qualified and skilled work force (Bauk and Jusufranic, 2014). There are different actions of the European Commission (EC) presented to reach the EUROPE2020 strategy goals (European Commission, 2017a). One of them is the ERASMUS+ Programme under which was project SP4CE (Strategic Partnership for Creativity and Entrepreneurship) developed. The project SP4CE promoted take-up of innovative practices in education, training by supporting personalized learning approaches, collaborative learning and critical thinking using of Information and Communication Technologies (ICT), Open Educational Resources (OER), open and flexible learning, virtual mobility and other innovative learning methods (like MOOC and gamification).

The purpose of this paper is to point out the current state at the field of human resources development in EU and activities needed to be done or actually under realization. Based on the official documents research, the analysis of the basic concept of the developed platform and its practical use, use-case study and pilot testing realization and evaluation is presented.

2 LITERATURE REVIEW AND PURPOSES FOR DEVELOPMENT THE SP4CE PROJECT

Economic and social progress stands on three pillars – research, innovation and higher education system, known as "Knowledge Triangle". European Commission (2015) states that education, research and innovation; universities, laboratories and companies; academics, researchers and entrepreneurs are part of an engine that, if is well managed, creates wealth, jobs, growth and social progress. Connectivity and cooperation among all parts of the knowledge triangle shapes ability to face challenges and secure welfare, security and well-being of EU citizens and allows adapt to changes.

One of the indicators of EU development is innovation. However, no one of pillars of the "Knowledge triangle" could exist separately. Due to the diversity of member countries, it is a huge variation in innovation performance across EU (Figure 1).

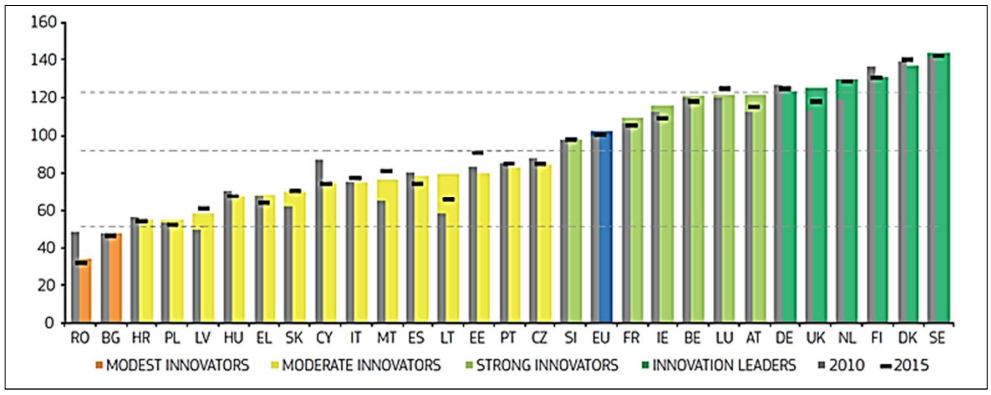


Figure 1 – Performance of EU Member States' Innovation System (Source: European Commission, 2017b)

Based on European Commission (2017b), the innovation performance gaps among EU countries still remain wide, but to positives could be included that EU members are making a good progress in fields like education and research, in broadband infrastructure and ICT training. The innovation leaders (i.e. Denmark, Finland, Germany, the Netherlands, Sweden, and the United Kingdom) have a balanced national research, higher education and innovation system that performs well. They have many and varied innovation ecosystems, in which people have incentives to connect, learn, adapt and change – across the conventional boundaries of the laboratory, factory and classroom. Universities can act as a catalyst for innovation arise (European Commission, 2015).

From Human capital theory (Schultz, 1961; Becker, 1964) follows that education increases individuals' productivity, what immediately has an impact on increase in job performance. Highly educated people are more successful in the labour market, because education provides marketable skills and abilities required by job (Cai, 2013). Benefits of higher education for the private part of life are employment prospects, higher salaries, and a greater ability to save and invest, which is connected to the public ones - higher earnings raise tax revenues for governments and ease demands on state finances, also translate into greater consumption, which benefits producers from all educational backgrounds (Bloom, Canning and Chan, 2006).

From that point of view, universities have become organizations that have an objective to operate more efficiently in relation to transformations to sustainability. They, together with employers, should take specific steps in order to intensify the cooperation in producing sustainability informed professional who will be able to engage with the economic and social dimensions of sustainability (Zuzeviciute et. al., 2017). Nowadays, seems to be crucial to harmonize learning provided by educational institutions with industry provided continuing professional learning. Both types of institutions focus on different targets of education. Universities are focused on educating people, creating new knowledge, and excelling at execution of existing knowledge, while companies

are concentrated on mastering the challenges of a competitive environment and striving for market success. The industry approach is based on the needs of acquiring, developing and retaining a skilled workforce. Universities co-working with industry may benefit from the knowledge, ideas and practices of working life outside the academy and could better fit currently provided education approaches to the practice needs (Slotte and Tynjälä, 2010; Brijs, 2017).

Creation of new partnerships between education and practice will provide the opportunity to develop and implement new models for sharing the expertise, resources, and power in each organization. Careful development, delivery and evaluation are important in collaborative education, especially clear definition of particular roles of the participants. For most educators, collaborative teaching is new and challenging experience. Research indicates that higher education is more effective when: principles of adult learning are used (e.g. problem-based learning and action learning sets), learning methods reflect the real world practice experiences of students (Zgodavová and Horvath, 2015). Participation on such kind of education gives those benefits in the fields of teamwork, roles and responsibilities, communication and learning and critical thinking (D'Amour and Oandasan, 2005; Rochelle and Teasdale, 1995).

In response to the needs on innovation education in way to improve students' employability higher education institutions had implemented work-integrated learning programs (Hardman and Averweg, 2011; Zgodavová, Kosc and Kekäle, 2001). As is stated in "Exploring 21st Century Skills" (Clarity innovation, 2013), collaboration becomes essential in teaching 21st Century Skills, because students who collaborate also increase their skills in problem-solving, creativity, and interpersonal relationships.

As is stated in Europe2020 strategy document, Europe faces with lack of people adapted to information society needs. Agenda "Education and Training 2020" (Danish Technological Institute, Directorate-General for Education, Youth, Sport and Culture (Shapiro et al., 2016)) set as targets that at least 40% of those aged 30 to 34 should have completed some form of higher education. Despite all official EU and governmental activities and linking practice with education, about 40% of employers continue to report dissatisfaction with the skills and competencies of graduates (Halvorsen, and Ibsen, 2017; Manpower Group, 2017). Based on survey realized in 2015 (Manpower Group, 2017) the employers report following barriers: lack of available applicants (24%), lack of hard skills – technical competencies (19%), lack of experience (19%), looking for more pay than is offered (14%) and lack of soft skills – workplace competencies (11%). The result of the survey realized among employers by Gallup Organization (2010) listed the ability to work in team, computer literacy and foreign language skills as very or rather important (Figure 2).

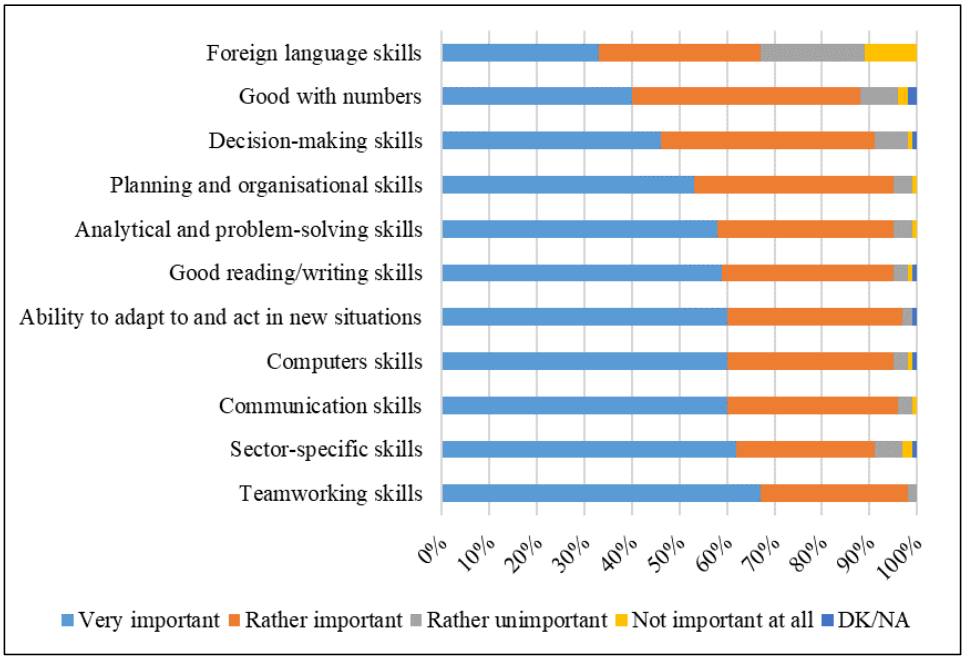


Figure 2 – Importance of Skills and Capabilities for Employers when Recruiting Higher Education Graduates - Percent of Employers Surveyed, 2010 (Source: Own, based on the Gallup Organization, 2010)

Thus, the most important abilities are included teamwork, communication skills, computers skills and ability to adapt-to and act in new situations. The project SP4CE was immediate reaction to this situation. Within the project, the partnership developed innovative tool for collaboration between universities and companies. This, low cost, solution employees well-known LMS Moodle courses as Learning Rooms, where students and companies should collaborate on various problem-solving. Using this platform, students have possibility to work in teams and solve the practical problems under the supervision of a person from the company. From previous follows, that collaboration is essential in teaching 21st Century Skills. Students who collaborate also increase their skills in problem-solving, creativity, and interpersonal relationships. From that point of view, the innovative approach is represented by using well-known education tool not only for educational purposes.

2.1 Enterprise-education Collaboration

Any collaboration is based on the objective of being a win-win situation. The European Commission (2017c) defined the collaboration as mutual engagement of participants on a coordinated effort to solve the problem together. Nowadays, collaboration is considered as an effective tool in education (Clarity innovations, 2013), because of its impact on students' motivation, problem-solving, relationships and creativity. There are various types of work-integrated learning

in higher education, including field experience, mandatory professional practice, co-operative education placements, internships, applied research, project learning and service learning. One of ways, which is the most preferable, that external experts from companies are paid for external teaching at the faculties. However, there are available other opportunities to reach market knowledge and practice and involve it to education for example blended learning. Employing ICT in collaborative learning, the academics and employers have a wide range of various collaboration tools, for example, standard internet tools and services (forum, blog, wiki, cloud-based text editors, spreadsheets, presentations, etc.) or specialized learning environments (e.g. LMS Moodle) with much more functionality. In case of more complex enterprise-education collaboration use of the LMSs seems to be the best choice, because the LMSs provide almost all necessary tools from mentioned eight categories, except visual and audio creation. In addition, use the LMS provide another one benefit, students work with an environment known to them because almost 64% of university students use one of LMS (LMS Moodle, Blackboard and Sakai) on regular basis (Fabuš and Fabušová, 2015).

2.2 Project SP4CE

SP4CE (Strategic Partnership for Creativity and Entrepreneurship) was a project funded by the European Commission under the ERASMUS+ Programme (SP4CE project consortium, 2015). The project SP4CE addresses the aims and needs identified in Bruges Communiqué on enhanced European cooperation in vocational education and training, especially that one "improving the quality and efficiency of Vocational Education and Training (VET) and enhancing its attractiveness and relevance" and "enhancing creativity, innovation and entrepreneurship" (European Commission, 2010). The main purpose of the project was to design innovative common e-learning tools for collaboration between students, enterprises and teachers. It is concentrated on identifying users' needs and supports the development of relations between them by mentoring and consulting activities. Those tools are available as ICT solution with web interface designed for three main target groups: Coaches (HR staff from enterprises), Mentors (teachers at vocational schools, universities and high schools) and Students (mostly young people who want to enter the labour market). Final product (the SP4CE platform) supports establishment and keeping the collaboration between students, enterprises and schools.

2.3 SP4CE Platform

The SP4CE platform proposes low cost, resp. no-additional cost solution to these problems. Anybody interested in cooperation can read general information about the SP4CE project and via challenge "Send us your project proposal" published on the portal, can anyone call for the help. After publishing challenge, the university teacher replies on the challenge. Via discussion tool at the portal company describes the requirement in more details and discussed it with the

teacher. Since both sides of communication agree on fact, that there is need for materials that cannot be published public, HR manager asks portal administrator to open a new Learning Room (LR) for newly formatted group and collaboration is established and using particular LR could be maintained (Figure 3).

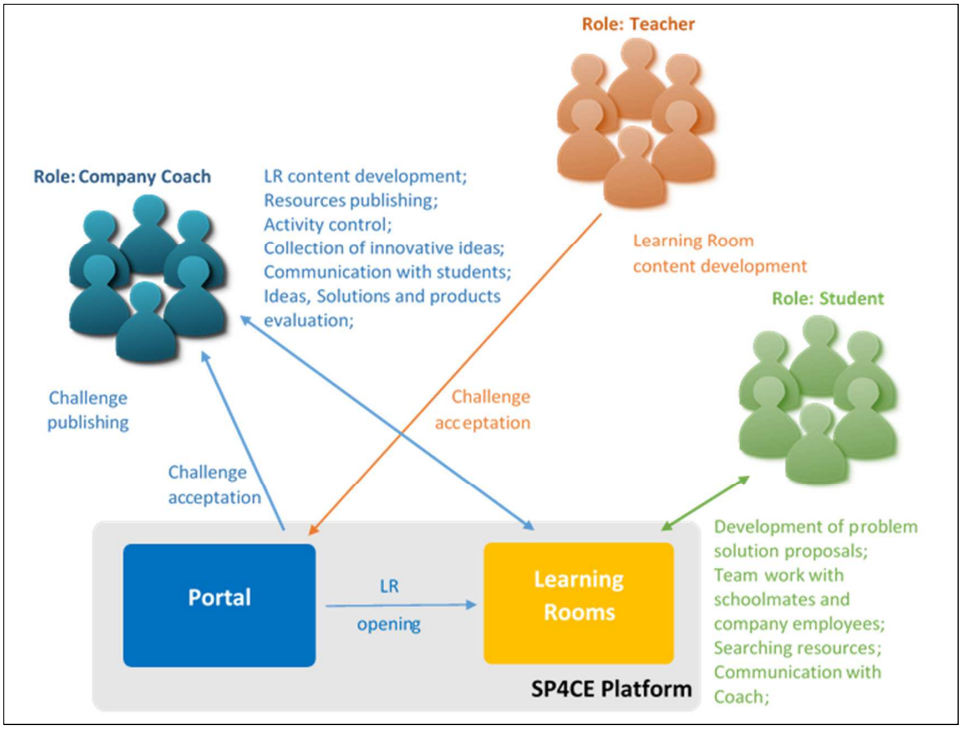


Figure 3 – SP4CE Platform (Source: Own Contribution)

The main idea of the SP4CE platform is to provide the list of Learning Rooms (LRs) concerned on specific problem that company face and publishable sources to help students understand the problem itself. Teacher/Mentor help coach to provide materials that are useful for students, to prepare place for discussion, interactive cooperation, new solution proposals and evaluation. At the same time, mentors (teachers) by using this system help students to establish successful cooperation with coaches from companies. Afterwards, students in connection to coach and teacher try to find out solution to provided problem. The platform this way involves users from different departments/organizations/companies working together in teams on specific project and tasks. This approach helps to make the most of all students' talents and abilities and enables functions to work together more effectively. That procedure could be a preparation of students for their work-life and may possibly result in the employment in this company in the future.

The SP4CE LRs are based on LMS Moodle, which is well-known Learning Management System (LMS). The LMS provides a wide range of not only

authoring tools, but features support the learner needs (social activities, resource and learning management, activity controlling, and personal publishing). SP4CE platform distinguishes four different roles – local administrator, coach, teacher and student – with a range of activities depending on the role of the user.

To reach this effect environment of LR provides following features for publishing information sources (eBook, file, label, page, external URL), for three level of activities concerned on individual work (assignment, lesson, quiz), on communication (survey, choice, chat) and for collaborative work of LR participants (glossary, dataBase, Forum, Wiki, Workshop)[1]. Coaches and teachers manage all specific tasks needed to be done during the problem solution. LR users' team consists of members with their own specialism and expertise, knowledge related to the problem, which needed to be solved. Using this collaborative environment takes students out of their usual studying to co-work with other with different ideas and knowledge and at not least with people from real companies. Everybody can use own competencies and skills to reach the best result.

3 RESULTS

3.1 Case Study: Using SP4CE-based Collaboration Between T-systems Company and Technical University of Kosice

T-Systems operates information and communication technology (ICT) systems for multinational corporations and public sector institutions. This company actively participates on the educational process at our faculty (Faculty of Economics, TUKE) through practical lectures, exercises and specialized subjects concerned on using specialized software and the company's processes, via internships of our students directly in the company or via various student competitions and the labour supplies. Quite often form of cooperation is work on real projects, resp. participation on the solution of the different problems through bachelor's and master's thesis. Searching for students for such kind of work is not easy. At present, this process is carried out following: the company offers a problem/cooperation to faculty management. Then the teacher that is interested in such work is searched using faculty's mailing list. Afterwards, the teacher tries to find the students. This process takes a long time (app. few weeks) when neither knows whether it will be a demand from the students' side for such a project/cooperation. In many cases, the result is, that companies stop propose such kind of cooperation to universities despite of interest from the side of universities. Despite the fact that on both sides of the process is interest in cooperation, collaboration often does not occur because, possible participants are not informed sufficiently and on time.

[1] The description of particular features used in LRs is available at https://docs.moodle.org.

The above-mentioned problem should be solved by using SP4CE platform by following: T-Systems published the challenge for design new projects (development of project proposals) about possibilities to develop Slovak regions using IT and EU funding. The technical university responded to the challenge and initiated the "Project Design and Management" LR and its integration into a course taught at the Faculty of Economics. Prior to the launch of LR, T-Systems' representatives and the subject teachers prepared LR content together, i.e. supporting materials for project design phase (project proposal development), roles within the project management and realization, methods of project realization in practice. Subsequently, participating students used not only prepared materials but also used various tools available in the LR environment for collaboration and communication within the course and among all work-team members. Through the LR, they became a part of real work-teams and their schedules and they actively could participate during the preparation of the project proposal. The interim results of the teams were uploaded to the LR, and were visible to the others and subsequently discussed in case of some problems arisen. Coach and mentor continuously commented these results, to allow remove mistakes by students' teams on time. Finally, coach, who evaluated the practical benefits of the project from the challenge point of view and the whole process of the project proposal design, evaluated every team project. Referring to the sub-competencies of employment and sustainability, we may state that this form of collaboration between the enterprises and universities provides an array of opportunities to educate students in almost all the sub-competencies of sustainability: transformative, communicative, and cross-cultural.

3.2 Outcomes, Lessons Learned

As has been mentioned, the SP4CE platform represents a low-cost solution, allowing simple, fast implementation, by using a user-friendly environment, simply scalable and supportive of the company's needs by its variety of plug-ins. There were established new contacts among educational institutions and companies. Even though mentioned positives, from the sustainability point of view there has been arisen some shortages of it, which are caused not only environment itself, but by the users: lack of motivation to use the system (especially from the bachelor study level students), which was caused by misunderstanding the main principles and objectives of the SP4CE platform. Adding more often and students' activity demanding tasks was this problem solved. More involved were students of master study level, because they are interested in participation on practical problem solving and for them it was a challenge to be part of real company work-team. The usage of other communication channels for work-team (e-mail, Skype), was the second problem arisen during pilot testing. It resulted into time delays, misunderstandings and inconsistencies in project solving schedule. Among other critical success factors should be concluded also dissemination of platform existence on both – education and companies – parts (for example at Slovakia took part on pilot

testing and following use only T-Systems company, but at Poland was the platform used more often, also for organizing the international conferences and workshops).

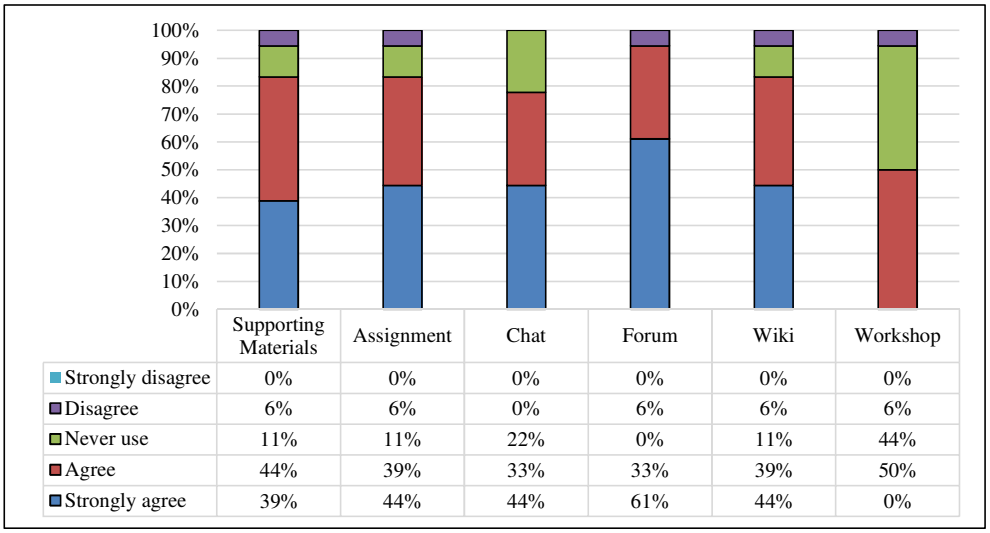
Based on pilot testing results and case study analysis, the LR effect should be generalized following: Companies have access to different interesting, innovating and untraditional solutions of the problems that they have to face and the SP4CE provides way to find innovative approaches and young and creative people, their potential future employees. The platform provides a possibility to find solution also via diploma thesis, where the student has more time to get into the more complex problem, into an enterprise environment and processes and provide more scientific approach. Via connection and collaboration with education institutions, they achieve the possibility to affect the content and style of education at educational institutions and get more precise information about a real knowledge and skills of students. Using platform, teachers should get access to contacts to people from external companies, what should lead to possible future cooperation not only via SP4CE but on projects, company education etc. Thanks to collaboration with practice, they could reach overview to marketplace requirements and find the way how to connect education with practical life and improve the education content and style. And finally – students – achieve free of charge possibility to reach different practical skills and knowledge in real company environment and possibility to check collaboration work style with different kind of people (nation, specialization, etc.) before their participation on the labour market.

3.3 Pilot Testing and Discussion

The designed SP4CE platform was tested during the pilot testing phase in 2016 – 2017. All partners' institutions of the project did pilot testing. There was created 121 Learning Rooms for four participant countries – Poland, Greece, Hungary and Slovakia with 476 registered users from 22 European countries. From the point of view of roles in the SP4CE platform, there are 5 Local (Country) Administrators, 48 Mentors, 23 Consultants (Coaches) and 409 Students in total. To support the pilot testers, the short videos about the functionality and types of services in Learning Rooms were developed and uploaded to YouTube. All pilot tests were realized following the goal – to check whether using the SP4CE platform is possible to fulfil the main project goal, to develop a tool enhancing collaboration between enterprises and universities. Every pilot was realized following the same scenario mentioned in the previous case study.

In order to carry out the evaluation of the platform functionality, a dedicated Learning Room (named "SP4CE - Evaluation") was opened. The pilot tests participants with different roles were asked to answer an interview concerned on the utility and functionality assessment of the SP4CE platform, as well as opinions on the tools they use in particular study rooms.

From the realized interviews follows, that vast majority of participants consider layout and form of the SP4CE platform (83.3%) and LR concept (94.4%) as clear and easy to use. Sixteen participants (88.8%) confirmed that the exemplary learning room and training videos created for testing the platform were very useful. The evaluators were also asked to sign the most frequently used Moodle tools and to indicate the ones they consider the best which best fit their needs, so which tool was most often used during the platform and learning room testing (Figure 4).



	Supporting Materials	Assignment	Chat	Forum	Wiki	Workshop
Strongly disagree	0%	0%	0%	0%	0%	0%
Disagree	6%	6%	0%	6%	6%	6%
Never use	11%	11%	22%	0%	11%	44%
Agree	44%	39%	33%	33%	39%	50%
Strongly agree	39%	44%	44%	61%	44%	0%

Figure 4 – Satisfaction with Mainly Used Tools in SP4CE Learning Rooms (Source: Own Contribution Based on SP4CE Project Data)

From Figure 4 follows, that not only tools that help collaboration are important to the participant, but also the appropriate supporting materials and assignments are really important for their future progress in the LR' topic. Because the project itself was concentrated on development and support collaboration between educational institutions and companies, we were interested in what is the pilot test participant' opinion about the best collaborative tool. From this point of view as the best tool was considered the forum tool (29%), followed by supporting materials (23%) and wiki sections (18%).

4 CONCLUSION

The prerequisite of the practice is to define the schedule of modern education and the curriculum, centred on the demand of the enterprises and enhancing the students' practical ability, and preceding from the practical situation. In order to enable universities to prepare students for practice, it is necessary to involve practice into education actively. Both large and small companies can no longer rely solely on their human resources, but the network of specialists working in

the different spheres of human life. Companies extensively encourage, explore and use external, or exchange internal, ideas to advance their technology – they operate in innovation ecosystems', where suppliers, academics, government programmes, individual consumers can take part. As a result of these innovation alliances, collaborative undergraduate, postgraduate and doctoral study programmes with placements, joint training and supervision, have become important recruitment routes allowing small companies to grow and expand.

The project SP4CE and its LRs represent innovative approach based on well-known LMS Moodle, for establishing contact between education and practice, what fulfils one of headline target of (European Commission, 2010). Using platform familiar to students and teachers is one of the pros of provided solution. It involves users from different departments/organizations/companies working together in teams on specific project and tasks. This approach helps to make the most of all students' talents and abilities and enables functions to work together more effectively. Realization of LR is a win-win solution – enterprises achieve new channel to find appropriate future employees and prepare them during their university study and universities should improve and innovate their curricula to fit better to the labour market and Industry 4.0 society needs. Based on the success of the SP4CE platform, the partnership of the project continues in their effort and project SP4CE is followed by new ERASMUS+ project, where the dedicated Learning Rooms will be established and used by new audience (e.g. SPADE).

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