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Barriers to Intrapreneurship

The Roles of Systems, Risk and Human Behavior in Developing Innovation

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Abstract— Intrapreneurship became a research topic of wide academic interest in recent times. The related subjects studied include its positive impact on organizations, the required working environments and external conditions as well as its impact on employees' behavior, motivation, etc. However, research on the potential barriers and risks related to intrapreneurship remains low. As recent studies tend to focus on single influence factors, there might also be a lack of systematic approaches to study the phenomena, acknowledging the variety of interdependent variables. This paper therefore suggests a systems theory-based approach to assess possible barriers of intrapreneurship in organizations under consideration of risk, systems and organizational behavior. After an outline of previous work on intrapreneurship in general and possible related threads and risk specifically, the sensitivity analysis method of Vester (2000) is adapted to develop a draft model of interconnected influence factors for intrapreneurial activities in organizations. This conceptual model should serve as a basis for further empirical research on the subject and supports the understanding of interdependencies between variables in an organisational system. The application of the model in a single-case study suggests that the influence factors 1) market situation, 2) attitude of employees, 3) skills and creativity, 4) values and goals of the organization, 5) working environment, 6) agility and rule breaking tolerance, 7) managerial processes or management support, 8) communication processes, 9) knowledge and 10) intangible assets could have a high impact on intrapreneurial activities. Future research could make use of this approach and empirically validate the conceptual model. It could be further enhanced through semantic modelling to illustrate the network of interdependencies.

Keywords—*Intrapreneurship; Corporate Entrepreneurship; Risk; Innovation; Systems Theory*

I. INTRODUCTION

Since Schumpeter started researching entrepreneurship in the early 20th century (Schumpeter, 1912; Schumpeter, 1934), the topic has gained in interest extensively and has been studied by researchers as well as practitioners (e.g. Baumol, 1990; Bull and Willard, 1993; Calisto and Sarkar, 2017; Foss, Lyngsie and Zahra, 2014; Kuratko et al., 2005; Miller, 1983; Minkes and Foxall, 2000; Swedberg, 2000). Over the years, it became widely accepted that Entrepreneurship is an important factor that supports society, economy and individual businesses to develop and to thrive (e.g. Drucker, 1985; Wennekers and Thurik, 1999). However, as today's fast-changing business environments are

increasingly shaped by global competition, shortened product and service lifecycles as well as disruptive innovations and business models, research on entrepreneurship might not provide the only answer for established organizations' further success and survival.

This might have been one reason for the establishment of a new research field that could transform the benefits of entrepreneurship, such as the innovativeness, agility and a positive attitude towards novelty and change, into existing businesses. This new research field emerged around 50 years after Schumpeter's work on Entrepreneurship and has been mainly referred to as Intrapreneurship (Peterson and Berger, 1971; Pinchot, 1978), Shared Entrepreneurship (Hutt, 1981; Shipper et al., 2014) and Corporate Entrepreneurship (Burgelman, 1983; Stopford and Charles, 1994). Influential research on this field dealt with, among other topics, the definition, clarification and validation of the intrapreneurial concept as such (e.g. Antoncic and Hisrich, 2001; Antoncic and Hisrich, 2003), the benefits of organizations through intrapreneurship (e.g. Antoncic and Antoncic, 2011; Dentchev et al., 2016; Parker, 2011), the linkages to economic growth (e.g. Wennekers and Thurik, 1999) and how organizations can foster intrapreneurship within their businesses (e.g. Alpkan et al., 2010).

One gap in the literature that the authors of this paper recently studied was the willingness of employees to adopt intrapreneurial behavior (Reuther et al., 2017; Reuther and Schumann, 2016). Reuther and Schumann (2016) questioned employees in Saxony (Germany) to understand whether or not they would like to act in an intrapreneurial way. Employees reported wanting to actively shape the future of their organization, but were not always provided with the opportunity to do so. This conceptual paper builds a foundation for studying barriers towards intrapreneurship and identifying factors which might prevent organizations from aspiring to an intrapreneurial culture. The paper also considers which level of intrapreneurship might be appropriate and desirable to facilitating this. Therefore, the aim of this paper is to assess possible barriers of intrapreneurship in organizations under consideration of risk, systems and organizational behavior using a systems theory based approach of interconnected thinking following the sensitivity analysis model of Vester (2000).

In order to achieve the goal of this paper in a structured and adequate way, the following aspects are examined: First, a short

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theoretical background of intrapreneurship is set out to highlight recent research results this work is built upon. This section also introduces a synoptic summary of theories related to risk and systems failure that are considered important in the course of this paper. The following section introduces the methodological approach and research model including some comments on the use of systems theory for innovation research. Then, a draft sensitivity analysis model based on Vester (2000) will be introduced to evaluate how various interdependent influence factors in the system 'organization' can foster or hinder intrapreneurial activities. Finally, opportunities for a case-sensitive, empirical validation of this work are introduced and possible areas of future research are set out on this basis.

II. THEORETICAL BACKGROUND

A. *Entrepreneurship and Intrapreneurship*

Early definitions by economists such as Cantillon, Say or Mill in the 18th and 19th centuries, as well as historical and economical studies strongly influenced by Weber and Schumpeter in the early 20th century leading to entrepreneurship becoming an increasingly important area of research (Cuervo, Ribeiro and Roig, 2007). After some debate on its clarity and delimitation as an independent research area (Busenitz et al., 2003; Venkataraman, 1997), entrepreneurship is now widely accepted and well-settled as a scientific research program in the field of business administration as well as increasingly transdisciplinary studies.

In contrast, entrepreneurship within organizations, referred to here as 'intrapreneurship' in the course of this paper, represents a much younger and developing research area. However, intrapreneurship became widely accepted much more quickly than traditional entrepreneurship before it, due to its roots in this already established field. Intrapreneurship started its development emerging out of entrepreneurship research and entrepreneurial leadership styles and, although related terms such as corporate entrepreneurship were already in use since 1930 (Lewis, 1937), an intensification of research is observable since the 1970s (Ping et al., 2010). The term intrapreneurship was introduced during that time by Pinchot (1978) and further definitions of related and often synonymously used terms, namely internal corporate entrepreneurship (Schollhammer, 1982), corporate entrepreneurship (Burgelman, 1983; Zahra, 1991) and shared entrepreneurship (Adams et al., 2014; Hutt, 1981; Shipper et al., 2014) emerged thereafter. This variety of approaches is one reason that intrapreneurship is still loosely defined (Gibb, 1996) and that different authors use different terms to describe and research the same phenomenon (Sharma and Chrisman, 2007). A decent overview of the development of terminologies and definitions over the years can be found in the article of Reuther et al. (2017)

However, there is a variety of research streams beyond the development of definitions. Some influential research in the field, related to the number of citations as identified by Reuther et al. (2017), looks into subjects as the linkages between entrepreneurial activity within large firms and economic growth (Wennekers and Thurik, 1999), the dimensions of intrapreneurial activities in organizations and its indicating role for growth (Antoncic and Hisrich, 2001; Antoncic and Hisrich,

2003), the actual mindset, role and support needs of the individual intrapreneur (Alpkan et al., 2010) and how intrapreneurship can emerge (Shah and Tripsas, 2007). Also, intrapreneurship-related theories supporting organizations to thrive in times of digitalization and global, fast-changing competitive environments have increasingly been recognized and addressed by recent research (Baruah and Ward, 2014; Calisto and Sarkar, 2017; Dentchev et al., 2016; Douglas and Fitzsimmons, 2012; Skarmeas, Lisboa and Saridakis, 2016), what might indicate that it is a research field that has not lost its relevance and topicality.

As most of what is known today about the intrapreneurship concept agrees in the positive impact it might have to any kind of organization, it is considerably important to look into aspects that can foster or hinder the effective integration of intrapreneurial activities within an organization. Research on risk and entrepreneurship tends to focus on the area of decision making, with an emphasis on 'risk seeking' as opposed 'risk averse' behaviour. This research originated in the area of safety critical systems, for example the selection of appropriate personnel to operate in processes where either risk taking was required, for example fighter aircraft fast jet pilots as opposed to pilots who need to be risk averse, for example commercial pilots (Lopes, 1987). This paper in contrast will focus on the as yet unconsidered area of the systemic context in which the decision maker operates, as opposed to the individual predisposition to take risks.

B. *Risk and Intrapreneurship*

Theorists interested in the study of risk and accident causation, crisis and resilience have long been interested in the use of systems theory and its applied approaches to understand how these events have come about. In terms of the use of systems theory, this could be grouped into three areas of literature. In the early phase, the interest was in understanding how major disasters took place and how response could be improved. The second phase is to use systems approaches to understand how risk and reliability can be used to prevent organization failure. However, the third phase of this development is about accepting that systems failures will always occur and the focus has now moved to resilience.

The first phase of systems use is typified by theorists such as Turner (1978), who have argued for a socio-technical systems approach to understanding systems failure. Turner's work originates from two sources, the original general systems theory by Bertalanffy (1951) and the work of the medical practitioner, Trist, who developed a general theory of organizational health and work effectiveness at the Tavistock Institute (Trist, 1963; Trist and Bamforth, 1951). In contrast to Turner, the management theorist Perrow (1984) argued for a different approach to understanding systems failure by analyzing the extent to which systems are either overly complex and/or tightly coupled. For both Turner and Perrow, their methodologies can be argued to be idealized for post event analysis and understanding how systems failure came about and using this knowledge to prevent further failures.

The second phase of systems theory applications focuses on high reliability organizations, where there is a need for frequent decisions with an extremely low error rate. Safety critical

systems such as air traffic control, rapid transit systems where there is no social and/or political acceptability for failure are good examples. Much of the work in the area of high reliability organizations typically looks at the structure and context of decision making, one of the best examples of this is the work of LaPorte and Consolini (1991) who argue that four factors influence an organization's ability to be able to confront and respond to threats of organizational. First, organizational decision making is based on expertise rather than rank. Second, in times of crisis, organizations are able to reconfigure themselves. Third, organizations are able to change communications and reporting from vertical to horizontal, in other words functional organizations can become matrix in structure and vice versa. Fourth, if we want to learn we should do this from healthy organizations, in other words we should learn from excellence not from failed organizations.

The third phase of systems theory use focusses on crisis management where crises are seen as low probability high impact events or even ill-structured events. Borodzicz argues that by looking at cases of successfully managed events in nearly every case, this is because the key decision-makers and responders were able to either directly break with the normal rules of engagement or at least adapt them flexibly to achieve a positive outcome (Borodzicz, 2004). In other words, the requirement for crisis response is for key decision makers to be 'innovative' in adapting well-rehearsed and structured plans in a way that facilitates a positive outcome. Much of the work in crisis management has focused on developing this capability either through the use of understanding how decision makers operate and their systemic context (Devitt and Borodzicz, 2008), or the use of crisis simulations (Borodzicz, 2005).

It is argued that the relevance of this to the world of intrapreneurship may be significant, as innovators are often working in tightly rule bound systems and may need to develop new solutions to old problems. Ironically, the more organizational rules are placed around such staff, the less likely they will be able to flexibly innovate.

Next to these three phases of the literature in relation to systems and risk, it can be seen in the context of managers' and employees' perceptions of risk in the context of intrapreneurship. How these perceptions could be defined will, to some extent, depend on individual predisposition to risk, in other words risk seeking as opposed to risk averse predispositions. It will also be affected by the organizational culture, the system of rules and sanctions and rewards that operate. For example, in the famous case of Barings Bank, the rogue trader Nick Leeson was prepared to take risks because of poor control of the access to funds, but also a belief that he would be able to remake the losses with further risk taking which sadly did not happen. One can only reflect and speculate what would have happened if he had been able to turn the situation around and would this have further facilitated the relaxed controls and environment that allowed him to risk the corporations' money to an even worse extent.

Other factors that have been identified in terms of risk taking look at the social status and gender of the decision maker (Fisk, Miller and Overton, 2017), the extent to which the country or culture would affect the systems within which the risks are taken (Lessard, 1996) and the extent to which decision makers may display impulsivity and sensation seeking (Lauriola et al., 2014).

TABLE I. IMPLICATIONS OF THREADS RELATED TO THE OPPORTUNITIES OF INTRAPRENEURSHIP

Aspect	Opportunity	Risk
Focus	Intrapreneurs are focused on the processes within the company.	Intrapreneurs are not mainly focused on the entire company.
Productivity	Intrapreneurs are contributors to increases in productivity within companies.	Intrapreneurs are influenced by knowledge of all internal risks
Innovation	Intrapreneurs are the drivers of innovation within companies.	Intrapreneurs gain their innovative power primarily as a knowledge of internal processes
Aptitude	Intrapreneurs build the aptitude to recognize and solve important problems.	Intrapreneurs build the aptitude to start a company, too.
Autonomy	The process of intrapreneurship requires autonomy and independence to truly investigate into problem solving.	Autonomous and independent intrapreneurs are harder to control.
Forecasting	Intrapreneurs as assets understand trends seeing where to go before anyone else.	The values of assets and staff retention efforts are constantly increasing.
Leadership	Intrapreneurs will become the building blocks of a company's executive teams and leaders.	Intrapreneurs become independent leaders with a penchant for independence
Wholeness	Intrapreneurs will be activated at each level to integrate each process into the greater whole.	Intrapreneurs are information carriers about the entire knowledge of the company.
Stakeholder	Intrapreneurs see the ability to grow personally along with the company and should be seen as investors in a company.	Intrapreneurs are no longer simply employees but stakeholders of the company.
Promotion	The entrepreneurs of the company have to find, hire and promote the intrapreneurs.	A complex continuous recruitment process has to be established and operated without disruption.

C. Opportunities Versus Threads of Intrapreneurship

Although the concept of intrapreneurship is widely recognized, there are also researchers who take a critical position. Especially a large increase in intrapreneurial activities throughout organizations is seen as an issue. For example, Morse (1986) argues that large organizations could never offer

the rewards and autonomy that an individual needs to act entrepreneurially, and that intrapreneurship could not lead to successful innovation. Further risk is associated with intrapreneurship in general and with the related increasing opportunities for engagement of the own staff specifically

(Kolev, Goldstein and Grossmann, 2015; Newlands, 2015). Some related implications are set out in Table 2.

It is suggested that owners and/or managers of an organization need to understand that the concept of intrapreneurship cannot be reduced to the selective promotion of small groups of employees, but rather need to be embedded in complex management and leadership styles to be implemented successfully. However, one must not only pursue the opportunities, but also minimize the threats that could arise from extended intrapreneurial activities through appropriate risk management.

III. METHODOLOGY

This conceptual paper follows a systems theory approach based on, amongst others, the work of Vester (2000), Luhmann (1984) and Parsons (1970) to develop a model of interconnected influence factors for intrapreneurial activities in organizations. Therefore, Parsons' AGIL scheme is introduced, including the extensions of Luhmann concerning autopoiesis, to conceptualize an action system of profit-oriented organizations. This structural-functional approach (Parsons, 1968; Parsons, 1970; Wilke, 2006) is considered to be helpful for the identification of variables or influence factors in an organizational system, as the AGIL scheme describes the components that necessarily need to interact for the emergence of an action in such a system. On that basis, a cross-impact matrix, a part of the sensitivity analysis approach (Vester, 2000), is adopted. The cross-impact matrix is filled with a number of variables that occur in an organizational system. These preliminary factors identified by the authors do not claim to be complete and can be subject to supplementation as well as case-sensitive adaption, as foreseen in sensitivity analytics (Vester, 2000). The model does not aim to be comprehensive, but to build a foundation for further, empirical studies of the subject area.

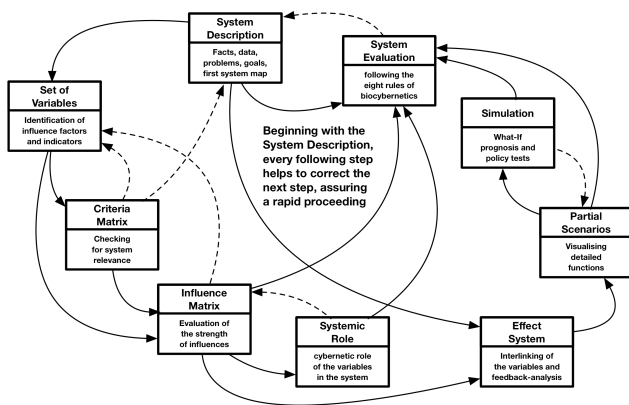


Fig. 1. The Structured Process of the Sensitivity Analysis (Vester, 2000)

The development process of the sensitivity analysis model according to Vester (2000) follows nine steps. The first six steps could be allocated to the modeling process and include 1) a description of the system, including facts, data, problems, goals and a first system map, 2) the identification of influence factors and indicators to gain a set of variables, 3) the evaluation of these variables' relevance for the system using a criteria matrix, 4)

questioning the interconnections of influence factors and assessing the strength of their influence on each other and the system using an influence matrix, 5) the description of the systemic roles by defining cybernetic roles of the variables in the system and 6) interlinking the variables as well as examining the overall interconnection in order to gain an understanding of the effect system. The last three steps can be used for a case-sensitive validation of the systems theory model and include 7) partial scenarios to visualize detailed functions of variables in the system, 8) simulations that include what-if prognosis and policy tests as well as 9) an overall system evaluation following the eight rules of bio-cybernetics. The exact process of the structured process of the sensitivity analysis including feedback loops and directions of information are set out in Figure 1.

Due to the specific scope of this paper, certain aspects have been extracted and adopted from Vester's model. The steps for cybernetic analysis (5-6) and case-sensitive validation (7-9) are dispensed, what benefits a wider range of possible applications for the desired model. The remaining four steps are adapted towards the goal of this paper. The system description is not specific to one organization, but builds a foundation for a variety of organizations that can be adapted towards the respective needs of future research. The identified variables including their relevance for the system and their interconnections are set out in the cross-impact matrix. These variables are focused on intrapreneurial activities and aspects that might foster or hinder them. The specific approach used in this paper is simplified and follows three key steps:

- 1) System Description
- 2) Set of Variables
- 3) Cross-Impact Matrix

The first step delivers a brief and general overview of a systems perspective on organizations that can potentially be used as a basis for researching a variety of subjects using systems theory based models. The set of variables is developed in the second step through the identification of specific influence factors on intrapreneurship based on the literature that are related to systems, processes and risk in organizations. In the third and final step, the interconnections of the system variables including their strength and relevance for the system are evaluated in an exemplary manner applying a cross-impact matrix on a single case study underpinned with insights of the literature. In their entirety, these steps should lead to a conceptual sensitivity model that provides first ideas on barriers to intrapreneurial activities in organizations and that can be used for future research to validate and extend the gained knowledge around this topic with empirical approaches.

It is acknowledged that this research including the development of the sensitivity model follows a research philosophy of interpretivism (see e.g. Klein and Myers, 1999; Saunders, Lewis and Thornhill, 2012). It is therefore subjective in nature, related to ontological stance, epistemology and axiology. The systematic approach chosen in the course of this paper suggests a new methodological approach that is different to previously used methods in studies of intrapreneurship. It can only constitute one opportunity to understand the interdependencies of organizational variables and their linkages

to intrapreneurial activity and is explicitly meant to build a basis for future empirical research to test identified factors and their actual influence and interdependencies in certain countries, industries, etc.

IV. SENSITIVITY ANALYSIS

A. System Description - The System of Organizations

As the first step of the proposed approach refers to a description of the system to be studied, some general characteristics of organizations under the scope of systems theory need to be considered. According to Luhmann (2017), the first characteristic of any system is its ability to create and restore itself, i.e. autopoiesis. This is crucial to understanding the focus of a systems theory approach towards an organization, as it can be understood as formed or created and maintained by the people it involves. Without them, there is no organization and if the organization fails and breaks, they form new structures or integrate into existing ones. This highlights the importance of people as actors in the system, who become central to any study of structures (created by them) or processes (undertaken by them). Most approaches to systems theory focus on capturing and understanding the formal system, however, people by their very nature, will always find informal ways of doing things, thereby adapting social and cultural knowledge about the system and fellow employees in order to achieve required outputs.

Beside this specific aspect, a more general definition of systems acknowledges that they are a collection of parts that can be subsystems or variables integrated to reach an overall goal and clearly distinguishable from a system environment (e.g. Bertalanffy, 1969; Luhmann, 1984; Parsons, 1970; Wilke, 2006). It can also be understood as a set of related operations (leading to the achievement of this goal) that can be distinguished from unrelated operations (Luhmann, 2017). For Vester (2000), the overall goal of any system is its self-preservation. Only thereafter follow any system context specific goals, such as e.g. profit making for businesses or service provision in the public sphere.

Before starting an analysis following the guidance of Vester (2000), it is considered useful to look at an organization as a system based on Parsons AGIL scheme that is part of the structural-functional approach (Parsons, 1951; Parsons, 1968; Parsons, 1970). AGIL stands for four components that necessarily need to interact for the emergence of an action, namely adaptation, goal attainment, integration and latent pattern maintenance. These components are constructed in the AGIL scheme using cross-classifications, whereby the rows distinguish internal and external relationships of the system and the columns instrumental aspects (means of action) and consummatory aspects (the satisfying state to be achieved). The original scheme describing human action in general can be found in Parsons (1970).

Following the descriptions of Luhmann (2017) and his analysis of the AGIL scheme, it is considered that the cross-classifications can be adapted towards an action system model for an organization that supports the first step of our partial sensitivity analysis. The external/instrumental field of adoption was already linked to the economy by (Parsons, 1970). For a profit-oriented organization, their external means of action

might be the creation of value and the generation of profit that constantly need to be adapted to fit the overall goal of any organization, the autopoiesis. This can be found in the goal attainment field, where the external state to be achieved is settled. In this context, a term that is closer to profit-oriented organizations than autopoiesis, but could describe the same issue is sustainability, not in a narrow sense of adequate use of resources, but in a holistic sense that basically refers to the self-preservation of the organization. The internal consummatory could include the target to be researched. Related to the topic of this paper, it could be the innovative capacity as one target of intrapreneurial activity or the level of integration of intrapreneurship into the organization. However, for other research subjects, it could be changed to e.g. turnover, profit, agility, or any other aspect that is considered suitable. The last field combines internal and instrumental aspects and is referred to as latent pattern maintenance, meaning the structures that need to be available, even if they are not used for some time. It is suggested that organizational processes in general suit the specifications of this field, as they need to be executable, but are not always performed at any time. On this basis, Figure 2 displays the suggested action system model of an organization.

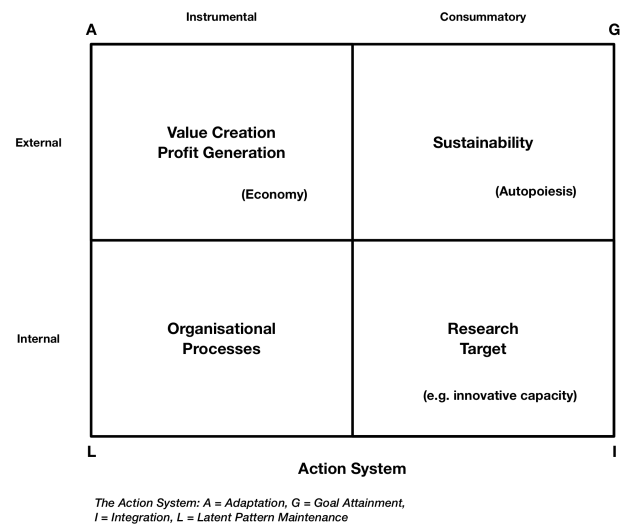


Fig. 2. AGIL Scheme - The Action System of Organizations

To develop a system description that suits the guidelines of Vester (2000), one concrete issue of the organization is considered and the model is specified towards this single aspect, without losing track on the variety of interconnected influence factors that affect this aspect. He suggests the discussion of the following questions as a basis for a first draft model, considering that not every question needs to be answered in full:

- 1) What are the problems?
- 2) What could be done to solve them?
- 3) What relates to these problems?
- 4) What are the limits?
- 5) Who is against it and why?
- 6) What needs to be preserved?

- 7) What makes the system work?
- 8) What are special features?

The considered challenge here lies in the definition of the problem and in the question of the level of abstraction. As this paper aims to reach an adaptable model with a wide range of applicability for further empirical research, a wider range of problems related to intrapreneurial activities in organizations have to be taken into account. The very first problem certainly relates to the overall goal that has been defined as the sustainability or self-preservation of the organization. One could argue, in the context of intrapreneurship, that the innovative capacity is the target size to be researched, as intrapreneurial activities usually foster and create new innovative solutions, e.g. products, services or processes. As this paper deals with the issue of barriers to such intrapreneurial activities, concrete problems might lay in the organizational processes that relate to intrapreneurial activities as well as the internal and external environment of the organization, including its structures, culture, etc. A description of the system could be illustrated as shown in Figure 3.

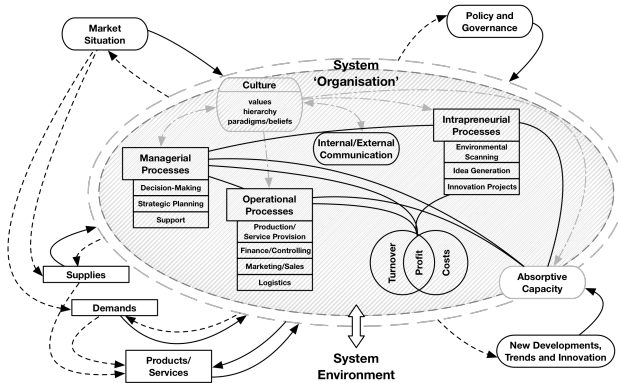


Fig. 3. A Draft Model of the System 'Organization'

B. Set of Variables - Influence Factors in the System

In the second step, based on the draft system model displayed in Figure 4, an amendable list of relevant variables is to be compiled. This set of influence factors first operates as the foundation for the cross-impact matrix and also for eventual future improvement and redesign of the draft model. Vester (2000) suggests the analysis of seven areas in relation to the system description to come up with this first list. These areas are:

- 1) People (Who is involved?)
- 2) Activities (What do they do?)
- 3) Location (Where does this happen?)
- 4) Perceptions (How do they feel about it?)
- 5) Relations to the Environment (How does the system interact with its environment?)

- 6) Internal Processes (Which communication channels exist?)
- 7) Internal Structures (How is that settled?)

At this stage of the sensitivity analysis, variables are identified and clustered towards certain categories based on the draft model, the questions introduced above and the literature set out in chapter two. Their interdependencies are to be assessed in the next step using the cross-impact matrix.

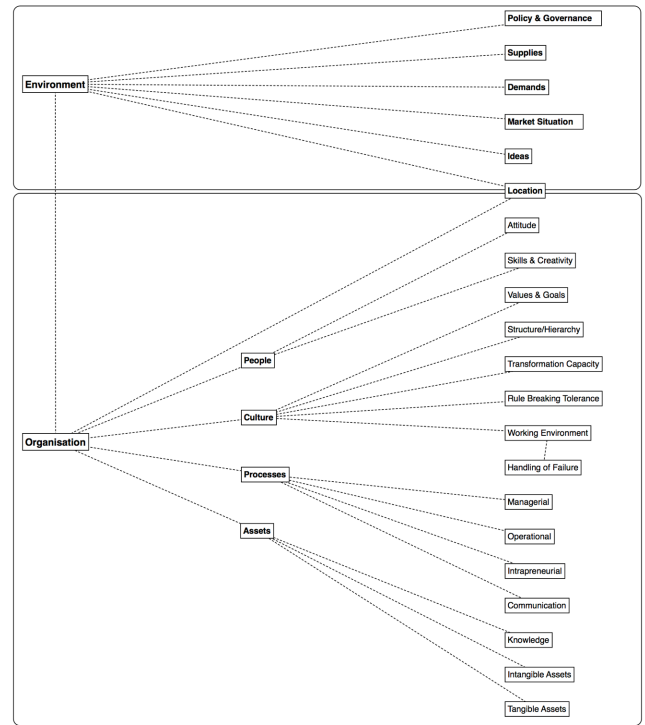


Fig. 4. List of Variables - Intrapreneurial Activities in Organizations (final)

One can differentiate the organizational system and the environment, following various sub-categories. The 'environment' relates to question five on the interaction of the system with its environment as well as question three on the 'location' of the organization that could be seen as both, environmental influence factor, as well as characteristic of the organization. While 'people' according to question one became a category on its own, questions two and six that relate to actions within the organization have been put together as 'processes'. The remaining questions four, on peoples' perceptions, and seven, on internal structures, have been put together in the category 'culture'. Finally, a category called 'assets' has been added to assess the influence of an organization's possessions. Based on the system description and the AGIL scheme of the organizational system, the variables are general in nature, but focused on the research subject of intrapreneurial activities. The list of variables compiled on the basis of these categories is illustrated in Figure 4. Following Vester's suggestion, it is not meant to be comprehensive and stays amendable as well as adoptable towards the analysis of specific cases.

Barriers of Intrapreneurship – Cross-Impact Matrix II (Vester,2003)

4-stage rating scale:
 3: small action of the influence factor in the rows (D3-D23) have big effects on factors in the columns (E2-X2)
 2: action of the influence factor in the rows lead to action of equal strength in the columns
 1: strong action in the rows has very small effect in the columns
 0: none, very weak or time--delayed impact

		Policy & Governance	Supplies	Demands	Market Situation	External Ideas	Location	Attitude	Skills & Creativity	Values & Goals	Structure & Hierarchy	Transformation Capacity	Working Environment	Agility & Rule Breaking Tolerance	Managerial Processes	Operational Processes	Intrapreneurial Processes	Communication Processes	Knowledge	Intangible Assets	Tangible Assets	Active-Sum (AS)	Interaction-Index (PS*AS)
Environment	1 Policy & Governance	X	2	1	2	1	1	0	0	0	0	0	0	1	1	1	1	0	0	1	1	13	65
	2 Supplies	0	X	2	1	0	0	0	0	0	0	0	0	0	1	2	1	0	1	2	2	12	228
	3 Demands	0	3	X	2	2	0	0	1	0	0	0	0	0	2	2	2	0	1	2	2	19	304
	4 Market Situation	2	3	3	X	2	0	1	1	0	0	2	1	1	3	3	3	0	1	3	3	32	512
	5 External Ideas	0	2	3	2	X	0	1	1	1	0	1	1	1	1	1	2	1	3	1	1	23	184
	6 Location	2	2	2	2	1	X	1	1	1	0	1	1	1	1	2	1	1	1	1	1	24	168
Organisation	7 Attitude	0	0	0	0	0	0	X	1	1	1	3	3	2	1	3	3	3	2	0	0	23	391
	8 Skills & Creativity	0	0	1	1	0	0	1	X	0	0	2	1	1	1	3	3	1	3	2	2	22	396
	9 Values & Goals	0	0	0	0	0	0	2	1	X	3	3	3	3	3	3	3	3	3	0	0	30	240
	10 Structure & Hierarchy	0	0	0	0	0	0	1	2	0	X	2	3	3	3	3	3	3	0	0	0	23	368
	11 Transformation Capacity	0	0	0	0	0	0	0	0	0	3	X	1	2	1	2	2	1	0	0	0	12	336
	12 Working Environment	0	0	0	0	0	0	3	1	1	2	2	X	3	2	3	3	3	3	0	0	26	702
	13 Agility & Rule Breaking Tolerance	0	0	0	0	0	0	2	1	0	1	3	1	X	2	2	3	1	1	0	0	17	459
	14 Managerial Processes	1	3	1	1	0	3	2	2	3	3	3	3	3	X	3	3	3	3	3	3	46	1518
	15 Operational Processes	0	2	1	1	0	0	1	2	0	0	0	0	1	0	1	X	2	2	2	2	19	855
	16 Intrapreneurial Processes	0	2	2	1	1	0	1	1	1	0	2	2	1	1	2	2	X	1	3	2	24	1080
	17 Communication Processes	0	0	0	1	1	0	1	1	0	2	2	3	3	3	3	3	3	X	3	2	29	696
	18 Knowledge	0	0	0	0	0	0	0	2	0	1	1	1	1	1	3	3	3	1	X	2	19	570
	19 Intangible Assets	0	0	0	1	0	1	0	0	0	0	1	1	1	1	2	3	3	0	0	X	15	375
	20 Tangible Assets	0	0	0	1	0	2	0	0	0	0	0	0	1	0	1	1	1	0	0	2	X	9
Passive-Sum (PS)		5	19	16	16	8	7	17	18	8	16	28	27	27	33	45	45	24	30	25	23		
Activity-Index (AS/PS)		2,6	0,6	1,2	2,0	2,9	3,4	1,4	1,2	3,8	1,4	0,4	1,0	0,6	1,4	0,4	0,5	1,2	0,6	0,6	0,4		

Fig. 5. Cross-Impact Matrix - Interdependencies in the Organizational System

C. Cross-Impact Matrix – Relevance and Interdependencies of Variables

The cross-impact matrix is used for an individual assessment of interdependencies between the identified variables, to understand their relevance for and interactions in the organizational system under the scope of incubators and barriers for intrapreneurial activities. Relationships between variables are rated using a four-stage scale consisting of the follow impact values:

3: small actions of the influence factor in the row have big effects on factors in the column

2: actions of the influence factor in the row lead to actions of equal strength in the column

1: big actions of the influence factor in the row have very small effects on factors in the column

0: none, very weak or time delayed impact

The exemplary ratings introduced in this paper are based on a single case study of a SME in the service sector in Saxony, Germany as well as the authors’ individual assessment. As they are subjective in nature, they are rather meant to illustrate the opportunities of an application of the sensitivity analysis approach then to deliver general, valid results. The application of the developed approach on the basis of empirical research is suggested to substantiate its deliverable results. However, to understand the mechanisms and opportunities of this approach

in the context of the application on organizational systems in general, the individual assessment provides a clear impression of future possibilities. The cross-impact matrix is displayed in Figure 5. On the basis of the cross-impact matrix, the relationships between variables and the network of interdependencies can be analyzed, transferred to mathematical models or illustrated and evaluated using semantic modelling. The active-sum (AS) indicates how strong a variable can impact other variables in the system, while the passive-sum (PS) indicates how strongly a variable can be influenced by others. Furthermore, the interaction-index ($INI=PS*AS$) states how strongly one influence factor interacts with the whole system. A high interaction index indicates a system-critical variable, a low one implies that the variable has a buffering character. Finally, the activity-index ($ACI=AS/PS$) suggests whether an influence factor is an active or reactive component of the system and thus whether or not it is suitable as a lever to influence the whole system.

Looking at intrapreneurial processes in this example, one can see that they have a relatively low active-sum of 24, with mainly weak or moderate influences on other variables. On the other hand, there is a very high passive sum of 44, which indicates that they are influenced by many other factors in the system. A relatively low activity-index makes sense, as intrapreneurial processes might often take place slightly detached from other processes and factors in the organizational system. They furthermore have a moderate interconnection-index, suggesting that they play a significant role in the system, but rather are influenced by other variables than impacting other elements of the system in a strong manner.

On the basis of the cross-impact matrix, one can identify several factors that are suggested to have a strong impact on intrapreneurial processes (3 on the cross-impact matrix scale) that can also be found in the intrapreneurship literature. These are the market situation (Reitz, 1998; Skarmas, Lisboa and Saridakis, 2016), the attitude of employees (Reuther et al., 2017), their skills and creativity (de Jong and Wennekers, 2008; Menzel, Aaltio and Ulijn, 2007; Pinchot, 1984), values and goals of the organization (Baruah and Ward, 2014), working environment (Antoncic and Hisrich, 2003; Antoncic and Antoncic, 2011), agility and rule breaking tolerance (Antoncic, 2003; de Jong and Wennekers, 2008), managerial processes or management support (Alpkan et al., 2010), communication processes (Antoncic and Hisrich, 2001), knowledge (Braunerhjelm, Ding and Thulin, 2017; Drejer, Christensen and Ulhoi, 2004) and intangible assets (Morse, 1986). Further empirical work on this topic could lead to case-sensitive, more precise impact values in the matrix and extend this list. The identified factors should be furthermore linked to the literature in more depth.

Beyond the identification of influence factors that can foster or hinder intrapreneurship, the interaction and activity-index can support decisions on which factors are suitable incubators. They help identifying how strongly other elements of a system are affected when one influence factor is changed to be dedicated to intrapreneurship. For instance, one could assess whether or not the operational business, working environment or assets of an organization might suffer when managerial processes, with a very high interaction-index, are focusing on the support of

intrapreneurial activities. One could also consider the role of values and goals of the organization, that have a very high activity-index because of their strong impact on several system elements and evaluate the consequences of their dedication to intrapreneurial processes on other variables.

V. CONCLUSION AND OUTLOOK

The aim of this paper was the discussion of possible barriers of intrapreneurial processes in organizations. As the intrapreneurship literature yet lacks holistic approaches that research the complex interdependencies of influence factors that need to be considered in relation to intrapreneurship, a systems theory based approach has been suggested.

Based on an action system of an organization developed using the AGIL scheme (Luhmann, 2017; Parsons, 1970), a draft set of variables has been set up for an analysis of interdependencies between variables using a cross-impact matrix as part of a sensitivity analysis (Vester, 2000). After applying and testing this method, it is considered to be a valuable new approach to understand how influence factors in organizational systems interact and impact intrapreneurial processes. To obtain valid results using this approach, empirical data should be used as a basis for the cross-impact matrix in future research.

The developed model introduced in the matrix is therefore based on a single case and the authors' assessment. It presents the opportunities that the use of systems theory approaches, namely sensitivity analysis, on the topic of intrapreneurship can raise and how this could contribute to a better understanding of the complexity of interdependent factors influencing intrapreneurial activities.

In accordance with the literature, the draft model suggests that the following factors could have a high impact on intrapreneurial processes, that are

- market situation,
- attitude of employees,
- skills and creativity,
- values and goals of the organization,
- working environment,
- agility and rule breaking tolerance,
- managerial processes or management support,
- communication processes,
- knowledge and
- intangible assets.

For future research, next to empirical work on the systems model and the cross-impact matrix, an illustrative approach is considered useful to understand the interdependencies of variables that are influence factors and, possibly, barriers of intrapreneurship in organizations. The leading ontological engineering tool (Gašević, Djurić and Devedžić, 2009) 'Protégé' from Stanford University could be used for semantic modelling (Musen, 2015). Protégé allows the display of interdependencies

as set out in the cross-impact matrix and the semantic analysis of relationships between variables, what is considered to be a useful part of further research on this topic.

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