Modelling of Information Flows in the Business Administration Realm
The Research Perspective

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Abstract: The main objective of information management is to ensure that valuable information is acquired and exploited to its fullest extent. From the research perspective, the information management constitutes currently a global and actual research topic. The main research construct of this paper is the information flow, since attention paid to understanding of information flow patterns or principles represents the area in which significant research results can be anticipated, for theoretical explanation is mostly linked to the realm of technical systems. The main objective of this discussion paper is to briefly review existing research results in this domain, identify the main gaps, and suggest project-based approach that can be discussed, scrutinised and consequently implemented. The research proposal is based on the mixed research methodology, which consists in the phenomenological research, the Grounded Theory, the replication multiple case-study, and system dynamics and multi-agent modelling.

1 INTRODUCTION

It was recognised long time ago that due to the critical dependency of organisations on information, improving its overall management can yield significant operational benefits to all areas of an organisation and importantly its overall efficiency, competitiveness and responsiveness (Hicks, 2007; Chaffey and Wood, 2004; Dietel, 2000). Simultaneously, the economic, business and social environment was strongly influenced by the emergence and consequent deployment of innovations in the field of information technologies during the last decades (Bureš et al., 2012; Mikulecký, 2011). This trend significantly shapes the way in which business is conducted and penetration of technologies is apparent in many areas such as product management (Zahay et al., 2011), knowledge management (Bureš and Brunet-Thornton, 2009), human resources management (Rodrigues and Raposo, 2011), performance evaluation (Mithas et al., 2011), or even soft disciplines such as cross-cultural management (Brunet-Thornton and Burš, 2012).

Information support of all processes and activities has its gratifying as well as seamy aspects. It is considered as beneficial for the business itself, however on the other hand it gives a rise to a phenomenon which we have been facing for several years - information overload (Tarafdar et al., 2013; van Velsen et al., 2013). This development led to the establishment of the new discipline which foundations were formed in early 1990's – information management. There are many definitions of information management extant, originating in the academia, public administration, research institutions, or business companies. Mostly the origins the information technologies are reflected; however many of them apply generic management terms to the information domain. Nevertheless, majority of definitions, regardless their origin, considers the necessity to manage all related activities such as the creation, representation, organisation, maintenance, visualisation, reuse, sharing, communication and disposal of information (Hicks, 2007), or the planning, budgeting, manipulating, and controlling of information throughout its life cycle (OMB, 2013).

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From an organisation's perspective the objective of information management is to ensure that valuable information is acquired and exploited to its fullest extent. This objective can be ensured by the usage of several existing information management frameworks. Not surprisingly, available framework are mostly IT-oriented, e.g. Zachman's (Frankel, 2003), or Henderson & Venkatraman's framework (Venkatraman, 1994). However, more holistic and balanced frameworks can be found. For instance, Linderman et al. (2005) suggest a reference model for information management to support information sharing needs. The model is based on several layers based on the core comprising information catalogues and repositories and consequent activities ranging from maintenance to security issues.

Maes (1999) in his series of working papers elaborates the Amsterdam Information Management Model. It provides a mapping of the relationships between organization and information. The Amsterdam Model can be used to support strategic discussions in three different ways:

- Descriptive, orientation – the framework offers a map of the entire information management domain, and can be used for positioning specific information management processes in the organization.
- Specification, design – the framework can be used to re-organize the information management organization, e.g. to specify the role of the Chief Information Officer (CIO) or determine the responsibilities of the retained organization in the case of outsourcing.
- Prescriptive, normative – the framework can be used as a diagnostic instrument to find gaps in an organization's information management, and specifically aimed at identifying missing interrelationships between the various components of the framework.

On the horizontal axis, the framework distinguishes three domains of governance: a) Business – this domain comprises all standard business functions such as management, HR, resources and processes; b) Information and Communication (information domain – this domain describes how information and communication supports the business); and c) Technology (IT domain – this domain specifically describes the development and management of particular IT solutions). The vertical axis describes the three levels of governance, namely Strategy (scope, core competencies and governance), Structure (architecture and competencies), and Operations (processes and skills).

2 PROBLEM FORMULATION

Apparently, the information management constitutes currently a global and actual research topic from the business administration perspective where papers with hundreds of citations in the recognised databases are not rare. Although the majority of research is conducted in the United States, the Peoples' Republic of China, and the United Kingdom (altogether 53,5 % out of 8372 of papers indexed in the Web of Science database with the key word "information management" to 19th March, 2013), the rest of publications was created in tens of countries around the Globe.

This national distribution does not represent a problem in comparison to the fact that 85,75 % of the same set of papers is associated solely with computer science or engineering. It indicates the endeavour to come with practical solutions which are mostly focused on problem-oriented technical solutions and are not unfortunately connected with any of existing theories related to business administration. Only few exceptions mostly originating in technical disciplines and applied to social ones, such as the Adaptive Structuration Theory (Desanctis and Poole, 1994) or the Max-flow Min-cut Theorem for network information flow (Ahlswede et al., 2000), can be found. Moreover, as the technology issues are advanced and urged, the organisational aspects are neglected. Some information flow mechanisms have been examined individually in the literature. For instance, Serra-Sastre and McGuire (2013) examine the role of different product information flows on the diffusion of new pharmaceuticals. Currently, the attention focused on understanding of information flow patterns or principles in particular represent the area in which significant research results can be anticipated, since theoretical explanation is still linked predominantly to the realm of technical systems. Results with the key word "information flow" in the Web of Science database are associated with Management (4.6 %), Business (2.8 %), Economics (2.7 %) and Business Finance (1.6 %), whereas Computer Science categories (e.g. Theory Methods, Information Systems, Software Engineering, or Interdisciplinary Applications) have altogether 66,9 %.

Furthermore, a strong tie to information technologies represents only on side of the issue. Closely related to the IT-centred approach to information management is its application at the higher maturity level solely in the large companies. Although small and medium-sized enterprises

(SMEs) represent the majority in all economies at the national level, they are often omitted in the research studies mostly due to their particularity and high variability. IT-centred approach and orientation based on large companies can be added to the list of gaps in the body of research in the information management domain, which was created by Niederman et al. (2012). The main research conjecture is that information flows in organisations can be modelled, theoretically explained and a generic model can be developed.

3 THE RESEARCH QUESTIONS

Current state of research results and main subjects of interest in the realm of information management open a new and up to now unsolved research question: Which ways and why are the information flows taking place in small and medium-sized enterprises? Finding out the answer is not a trivial problem, therefore the main research question has to be decomposed to several partial research questions which have to be asked and answers found with the help of appropriate methods and techniques. These questions are:

- How can be the information flow anchored to the existing theories in the realm of business administration?
- Which dimensions need to be considered during the investigation of information flows in SMEs?
- What attributes of information flows can be identified?
- How do certain variables such as CIO or IT deployment determine the form of information flows?
- What are the most suitable ways of information flows modelling in SMEs?
- Is the classification of information flow models possible and on which criteria?

4 THE PROPOSED METHODOLOGY

Answers to the research questions might be found with the help of the mixed research methodology (Tashakkori and Teddlie, 2003). Hence, the suggested methodology consists of two main parts – qualitative and quantitative research.

Firstly, the qualitative research needs to be conducted to find out principal theoretical starting points for further research. The theoretical sampling (Glaser and Strauss, 1967) can represent the main sampling approach used for data collection. Consequently, the basic sampling techniques used in qualitative research can be applied, namely snowball technique, criteria-based technique, critical-case selection, and stratified sampling (Patton, 1990). This part of research should comprise three main stages – analytical, synthetic stage, and the verification stage:

A. The main aim of the analytical stage is to acquire insight into phenomena and dimensions of information flows (e.g. actors, informational channels, or content classifications) and their mutual interrelationship. This stage is grounded in:
   a. the phenomenological research. Data and methodological triangulation should be assured by two methods of data gathering – non-formal interview (in which critical event technique, or stimulated recalling might be used); and structured open interview (in which open questions, or expert interview can be applied). Due to the existing situation depicted in the first section of this paper the core sample set of informants can consist of small and medium-sized IT companies. Further sample set extension can be based on the snowball technique and the criteria-based technique;
   b. document analysis (both paper and electronic ones) which should uncover additional factors influencing information flows in organisations that are difficult to capture by means of interviews.

B. The main aim of the synthetic stage is to formulate theoretical explanation of investigated structure and behaviour of the information flows in SMEs and to suggest preliminary model based on the Grounded Theory which represents the main research method of this stage. Formulation of the concepts, categories and propositions has to be based on outcomes of the previous stage with the help of verbal formulation, flow charts, class diagrams, model boundary diagram, or the subsystem diagram. Existing theories in related disciplines (analogically to the Theory of Constrains (Rahman, 1998) applied in the business domain) need be considered.

BPM/ISM Techniques	Modeling Perspectives (Depth)			
	Functional	Behavioral	Organizational	Informational
Flowchart	Yes	No	No	Limited
IDEF0	Yes	No	Limited	No
IDEF3	Limited	Limited	No	Limited
Petri nets	Yes	Yes	No	No
Discrete event simulation	Yes	Yes	Yes	Limited
System dynamics	Limited	Yes	Yes	Limited
Knowledge-based techniques	No	Yes	No	No
Role activity diagram	No	Limited	Yes	No
Data flow diagram	Yes	No	Limited	Yes
Entity-relationship diagram	No	No	No	Yes
State-transition diagram	No	Limited	No	Limited
IDEF1*x*	No	No	No	Yes
UML‘	Yes	Limited	Limited	Yes

Figure 1: Potential modelling techniques (adopted from (Giaglis, 2001)).

C. The main aim of the verification stage is to confirm, modify if necessary and validate the created models with different granularity within the selected organisations. The replication multiple case study (Yin, 1994) can be the main method applied. In this stage the critical case selection and stratified sampling are to be the principle sampling methods. Secondly, the quantitative research needs to be conducted to explore mutual interrelationship among particular factors of the developed model and identification of existing patterns. First of all the outcomes of the qualitative research has to be transformed to specific models. There is a variety of available modelling techniques ranging from usage of mathematical formalisation (Gavalec et al., 2011) to application of graphical tools (Olševičová at al., 2010). The selection of modelling techniques can be based on results published by Giaglis (2001), who classified modelling approaches according to their ability to model systems from functional, behavioural, organisational, and informational perspective (see Figure 1). Based on his conclusions the system dynamics approach and multi-agent modelling seems to be the best available modelling alternatives. Consequently, the models need to be filled with real testing data to enable complexity capturing, simulations and quantified evaluation (Bureš and Čech, 2007). Data can be acquired from organisations that comprise the sample in the qualitative research phase of the project.

5 CONCLUSIONS

Aim of this paper is to liven up the discussion on information flows and related research in the business administration domain. Business administration as a multidisciplinary field of study suffers from adapting various concepts which originated in other disciplines. From the research perspective, the complete adoption to the business administration has to be based on interconnection of new concepts with existing theories. In case of information management in general and information flow modelling, simulation and monitoring in particular, the IT-centred approaches and perspectives still prevail. Therefore, this paper outlines the research problem and suggests methodological approach to its solution that can be discussed, scrutinised, modified and consequently implemented in practice. This can lead to better insight into dynamic behaviour of information flows in organisations and further development of the business administration realm.

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