The Fuzzy Front-End of Digital Transformation: Three Perspectives on the Formulation of Organizational Change Strategies

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Abstract

The fuzzy front-end describes the random and generally vague initial stages of an innovation project. Since digital transformation can be seen as innovation process of an organization, improving the initial stages can be beneficial for the entire process. This literature review takes the unique perspective of the fuzzy front-end within digital transformation. Characteristics of and challenges in formulating of organizational change strategies are reviewed in three different domains: information systems (IS), management & strategy (MS), and organization science (OS). The results show that within IS, the role of information systems has changed from a process-oriented to a more strategic role and digital technology skills become more important during strategy formulation. Within MS, there is a strong focus on interpreting external signals and reacting to them. In OS, the formulation of a change strategy is seen as a collaborative process between leadership and the workforce. The results from this review should encourage the research on digital transformation to focus to a greater extent on the initial phase of strategy formulation.

Keywords: Digital Transformation, Organizational Change, Strategy Formulation, Strategic Planning, Strategy Formation, Fuzzy Front-End, Literature Review

1 Introduction

In new product development, the initial phase of idea creation before the formal initiation of an innovation project is known as the fuzzy front-end (FFE) (Smith & Reinertsen, 1991). It is typical of the front-end stages of an innovation project, that the outcome is not clearly defined, there is no common vision, and there are various possible courses of action (Rhea, 2003). Yet, the initial phase is essential for several reasons. Firstly, it has often been shown that poor planning at the beginning results in more difficulties during the execution of the
project and a less successful outcome (Smith & Reinertsen, 1991). Secondly, investing in research activities at the start of a project could lead to more significant innovations being created, rather than relying on the emergence of incremental innovations during the course of the project (Rhea, 2003). Ultimately, a greater consideration of the front-end instead of the execution phases can leverage the overall project success (Verworn, 2009).

A considerable body of research is available on strategies for improving the fuzzy font-end within the new product development domain (Alam, 2006; Koen et al., 2002; Reid & de Brentani, 2004; Rhea, 2003). However, to the best of our knowledge this concept has not yet been applied to organizational change processes that can be understood as innovation processes for an entire organization.

Digital business transformation is currently an important challenge for managers designing change towards the digital age (Matt, Hess, & Benlian, 2015). In this present paper, the term digital business transformation is defined as transformation at the organizational level that is disruptive, rather than a continuous learning process. It simultaneously affects multiple areas within the organization and requires a re-definition of the corporate strategy. The dynamic development of digital technologies means that an understanding of digital technology and its applications is no longer a task of the IT or digital business department alone (Horlacher & Hess, 2016; Reynolds & Yetton, 2015). Rather, it needs to be an integral part of corporate strategy (Drnevich & Croson, 2013). Sensing relevant digital innovations, creating an understanding of the impact of digital technologies, and formulating a new strategy for the digital age are important and pressing topics for managers (Carlo, Lyytinen, & Rose, 2012). However, the activities and outcome of digital business transformation are largely unclear and fuzzy. Many decision makers sense technological changes and the resulting competitive context shifts which can potentially have a profound impact on their organizations, but it is not yet clear, how they should prepare and what steps are needed in order to respond appropriately to these threats.

In order to better understand this front-end phase of digital business transformation, this paper takes the unique perspective of the fuzzy front-end within organizational change processes. Digital business transformation is a topic that is being worked on within different disciplines. The research objective is to explore whether and to what extent the front-end stages of organizational change processes are considered within information systems (IS), organization science (OS) and management and strategy (MS). The aim of this literature review is to systematically analyze the current knowledge on the front-end of organizational transformation processes in different disciplines, in order to better understand the phenomenon and inspire a body of knowledge on digital business transformation. The guiding research questions for this paper are: To what extent is the FFE phase considered in the IS, ORG, and MS fields? What are the important characteristics and challenges within the FFE of digital business transformation within the IS, ORG and MS fields?
2 Prior Research: Fuzzy Front-End of Strategy Formulation

In project management, the front-end describes the planning phases before the execution of a project. The front-end stage of a project, be it a new product development or organizational innovation project, is important, because most of the innovation is created during these stages (Rhea, 2003). However, this phase may also be seen as the beginning of a betting process. Only at the end will the participants be able to place the bet on a certain option, which during the process has been regarded as the most promising (Reinertsen, 1999). The term “fuzzy front-end” (FFE) describes the initial phase of innovation activity in the development of new products. The fuzzy front-end is the precursor of the actual new product development project and covers the stages from idea generation until the start of the formal project. During this phase, the outcome is unclear and the fuzzy front-end is often perceived as ill-defined, random and mysterious (Rhea, 2003; Smith & Reinertsen, 1991). In the product innovation domain, the concept of the fuzzy front-end is of great interest for researchers, since these very early stages provide an excellent opportunity for improving the overall innovation process (Verworn, 2009) and lead to competitive advantages (Reid & de Brentani, 2004). Several activities are part of the fuzzy front-end stage of a project, such as detecting technological development from the environment (de Brentani & Reid, 2012), or changes in customer interaction (Alam, 2006), assessing the potential, and developing a concept as to how they can be applied to the business (Montoya-Weiss & O’Driscoll, 2000). This phase of the innovation process relies heavily on information flows. A theoretical model of the structure and process of the FFE identifies the boundary (between organization and environment), gatekeeping (between innovators and decision makers) and project (between decision makers and project managers) as the most relevant interfaces in this process, in order to ensure a sufficient information flow and improve the FFE (de Brentani & Reid, 2012).

The front-end of strategy processes has been of interest in the literature on information-technology-enabled transformation (ITOT). Besson & Rowe (2012) identify several publications on the “phase of upheaval”, as it is referred to in the punctuated equilibrium (PE) model. In contrast to the idea of continuous change, the PE theory argues, that phases of relative stability are followed by phases of rather radical changes, before the organization again returns to a stable state (Romanelli & Tushman, 1994). However, the literature also reveals that the phase of upheaval receives relatively little attention among researchers (Besson & Rowe, 2012), compared to other phases in the strategy process.

Kurt Lewin’s three-stage model of change – unfreezing, changing and refreezing – also acknowledges the front-end stage of change within the unfreezing stage. This is when the company recognizes that there is a need to change and starts defining the concept (Lewin, 1963). The phase of unfreezing is also characterized by overcoming defense mechanisms within the organization, as it is necessary to recognize that established ways of thinking may not be appropriate or valuable in the new organizational context. Current patterns of operation cannot be applied, so that this phase is characterized by a certain confusion as to the best way forward (Mintzberg, Ahlstrand, & Lampel, 1998).
Davis et al. (2010) explicitly mention the front-end phase in their strategy model as the visioning phase. This phase comprises activities such as exploring different options for future directions, building a common vision, and risk assessment (Davis, Kee, & Newcomer, 2010). Within the strategy schools of Mintzberg et al. (1998), the creation of a vision as central part of the strategy formation process is acknowledged within the entrepreneurial school. However, within this school, the development of a vision is the task of a single leader, which does not recognize the establishment of a vision as a group effort. This is part of the learning school, which states that any informed individual within the organization can contribute to the strategy process (Mintzberg et al., 1998). Since the impact of digital business transformation can be sensed and evaluated in several business units, making sense of technological changes and their impacts on the organization are not the task of a single leader, but of potentially everybody in the organization, which may contribute to the “fuzziness” of the front-end phase.

3 Research Design

Digital transformation is a specific kind of organizational change. In order to determine to what extent the strategy formulation phase is considered in different disciplines, a systematic literature review has been conducted according to the principles of (Vom Brocke et al., 2009; Webster & Watson, 2002). Three baskets of journals have been compiled for the three disciplines that explore digital business transformation: Information systems (IS), Management & Strategy (MS), and Organization Science (OS). The baskets contain all journals that have been ranked as A+ / A in the “VHB Jourqual 3” ranking. The research was restricted to the top journals, as these are assumed to be representative of the general course of research within each discipline. In total, 39 journals were selected as the database for the literature search.

<table>
<thead>
<tr>
<th>Basket</th>
<th>Information Systems</th>
<th>Organization Science</th>
<th>Management &amp; Strategy</th>
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<tbody>
<tr>
<td>Search term</td>
<td>&quot;organizational change&quot; AND (&quot;strategy formulation&quot;) OR (&quot;strategy formation&quot;) OR (&quot;strategic planning&quot;)</td>
<td>&quot;organizational change&quot; AND (&quot;strategy formulation&quot;) OR (&quot;strategy formation&quot;) OR (&quot;strategic planning&quot;)</td>
<td>&quot;organizational change&quot; AND (&quot;strategy formulation&quot;) OR (&quot;strategy formation&quot;) OR (&quot;strategic planning&quot;) AND (technology OR digital)</td>
</tr>
<tr>
<td>Relevant Results</td>
<td>34</td>
<td>16</td>
<td>62</td>
</tr>
</tbody>
</table>

Table 1: Documentation of literature search

For the search string, the term “organizational change” was found to provide the best results, since this is the generic term for transformation / change programs. It was combined with the terms “strategy formation” / “strategy formulation” / “strategic planning”, in order to identify papers that specifically consider the initial strategy-building phase of the change process. For
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The MS basket this search term yielded a much larger number of results. Therefore the terms “digital” OR “technology” were added, in order to restrict this number to specifically technology-induced changes. Conceptual papers with an exclusively theoretical research were omitted from analysis. Table 1 provides an overview of the search terms used and the results yielded in the respective baskets.

The result lists were exported and coded in Excel. Based on the information given in the title, abstract, and subject terms, the 112 papers were coded according to the scheme depicted in Table 2. The coding scheme for the strategy phases was derived from the phases mentioned in Davis et al. (2010) – vision, planning, and implementation. A fourth code “outcome” was added for publications that consider the results, impact, and effects of a strategy or organizational change process and not the process itself. The coding scheme for the type of change strategy was derived from Mintzberg’s types (intended, deliberate, emergent) (Mintzberg & Waters, 1982), which acknowledge that there is both planned and unplanned change. The degree / scope of change was derived from the types of innovation, which acknowledges that there are types of evolutionary and radical change (Norman & Verganti, 2014).

<table>
<thead>
<tr>
<th>Strategy Phase</th>
<th>Type of change strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>Intentionality</td>
</tr>
<tr>
<td>Planning</td>
<td>• Intended</td>
</tr>
<tr>
<td>Implementation</td>
<td>• Emergent</td>
</tr>
<tr>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>Degree / Scope</td>
<td>• Radical / Disruptive</td>
</tr>
<tr>
<td></td>
<td>• Evolutionary / Continuous</td>
</tr>
</tbody>
</table>

Table 2: Coding scheme for literature review

4 Findings

The retrieved overview of publications shows that the number of publications on organizational change and strategy formulation in A / A+ journals became more popular in the 1990s and has remained steady ever since (see Figure 1). The rising popularity of digital business transformation as a specific type of organizational change cannot be determined purely from the number of publications.
The following table shows that the fuzzy front-end of the change strategy, which is the first phase of recognizing the need to initiate an organizational change process and build a common vision receives comparably little research attention. Most publications focus on the planning process and the implementation phase, regardless of the discipline.

<table>
<thead>
<tr>
<th></th>
<th>Vision</th>
<th>Planning</th>
<th>Implementation</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Information</td>
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<tr>
<td>Systems</td>
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<td>Management &amp;</td>
<td>![Icon]</td>
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<tr>
<td>Strategy</td>
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<tr>
<td>Organization</td>
<td>![Icon]</td>
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<td>![Icon]</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Science</td>
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</tbody>
</table>

**Legend:**
- **Frequently covered**
- **Partially covered**
- **Barely covered**

**Table 3: Analysis per basket of strategy phases considered**

Digital business transformation can be seen as a major reorientation for the organization and therefore has an extremely wide scope and a disruptive impact. As can be seen from Table 4, research generally focuses rather on evolutionary changes that might occur more often and are therefore easier to observe. The same challenge probably applies to emergent strategies that are developed without being intended, but arise as the organization progresses...
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(Mintzberg & Waters, 1982). However, current changes due to the transition into the digital age provide an excellent environment for researching major, more radical organizational changes.

**Table 4:** Analysis per basket of change strategy type

<table>
<thead>
<tr>
<th></th>
<th>Intended</th>
<th>Emergent</th>
<th>Radical</th>
<th>Evolutionary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Systems</td>
<td><img src="image.png" alt="Diagram" /></td>
<td><img src="image.png" alt="Diagram" /></td>
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<tr>
<td>Management &amp; Strategy</td>
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<td>Organization Science</td>
<td><img src="image.png" alt="Diagram" /></td>
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<td><img src="image.png" alt="Diagram" /></td>
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</tr>
</tbody>
</table>

**Legend:**
- Frequently covered
- Partially covered
- Barely covered

### 4.1 Information Systems (IS) Perspective

Within the IS domain, there is a clear focus on the relationship between information systems and organizational configuration. Therefore, many publications focus on the change process from the perspective of technology implementation, and its effects on organizational processes as well as user behavior, for instance in research on technology adoption (Venkatesh, Morris, Davis, & Davis, 2003).

The guiding research topic is strategic change that is enabled by information technology (Besson & Rowe, 2012; Cha, Hwang, & Gregor, 2015; Cha & Lee, 2013) or the introduction of disruptive digital technologies that force organizations to initiate a major strategic reorientation. As digital technology advances, highly innovative technologies have an impact on the project portfolio and product offerings of organizations. Therefore, there is a broad body of case study research on it-enabled digital transformation (Clemons & Hann, 1999; Harkness, Segars, & Kettinger, 1996; Sarker & Lee, 1999).

Regarding the front-end of transformation strategy, there has been a focus on IS-strategy. IS-strategy formulation is traditionally different from organizational strategic planning, as it focuses strongly on business processes instead of the organizational context (Burn, 1993). However, it has been generally acknowledged that business and IS-strategy should be integrated into a common digital strategy (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Drnevich & Croson, 2013; Pagani, 2013). A reason for this is that IT has evolved from its traditional role as a support function into a more strategic role (Henderson & Venkatraman, 1993). This organizational emphasis on IT decisions affects top manager knowledge of IT, which also facilitates business manager participation in strategic IT planning (Bassellier & Benbasat, 2004; Kears & Sabherwal, 2007). However, in many companies, the IS department
lacks formal power to influence the organization’s targeted change. Hence, IT executives need to act as change agents in order to gain support from top management (Ngwenyama & Nielsen, 2013; Sharma & Shanks, 2011) and work actively on the positive perception of IT value, so as to achieve consensus (Tallon, 2013). This goes even further than just aligning IT and business goals, requiring collaboration between IT and business departments. Developing a shared mindset between IS and business leaders is a precondition for making IT part of the strategic core (Hansen, Kraemmergaard, & Mathiassen, 2011; Qu, Oh, & Pinsonneault, 2010).

4.2 Management and Strategy Perspective

Guiding research on strategy formulation for organizational change within the management and strategy domain are the roles of the market, technological and competitive environment (Randolph & Dess, 1984), strategic adaptation, exploitation of market knowledge, and the role of top executives.

Radical change is often initiated as a reaction to a turbulent environment (Lant, Milliken, & Batra, 1992) that can be caused by technological innovation (Williams, 1983), competitors attacking the core business (Sanchez, 1995) or by market changes and practices that spread in other organizations (Gaba & Meyer, 2008). The changing behavior of customers is also part of the environment. Discovering customer needs and addressing them in the product offering may influence the success of a company (Christensen & Bower, 1996). The development and dynamics of the market, technological, and competitive environment cannot be predicted accurately, which contributes to the fuzziness of the initial phase of a transformation strategy. Therefore, in an unstable environment, companies have to carefully monitor the changes and continuously adjust their strategy. Instead of long-term strategic planning, companies generally prefer smaller steps of action and readjusting, thus incrementally adapting their strategy as they progress (Brown & Eisenhardt, 1997; Kiss & Barr, 2015). Exploiting knowledge on the environment is not only important for strategic planning, but also for the creation of innovative products, which is a key capability of a learning and continuously renewing organization (Dougherty, 1992). Also, the current strategy may influence future technology, as strategy and technology are intrinsically linked (Itami & Numagami, 1992). Technological innovations are found to have an effect on the scope of the corporate portfolio (Kaul, 2012). Therefore, knowledge of technology can be seen as an important capability in strategy work.

Making sense of industry signals is mostly seen as the task of top management (Williams, 1983), and to be strongly influenced by their belief structures (Kiss & Barr, 2015). While the effect of managerial learning on strategic reorientation is often researched (Lant et al., 1992), other publications stress that exploiting market knowledge for product innovation is not the responsibility of one organizational function, but requires a broader involvement of the workforce and thus a new sense of roles and responsibilities (Dougherty, 1992). The orientation of top management towards change is a key prerequisite for successful innovation (Zmud, 1984) and for knowledge transfer within the organization. Instead of only reacting to
the environment, companies may use the first phase of the strategic planning process in order to proactively tackle the reorientation of the company and not only involve top management in this process (Mitroff, Barabba, & Kilmann, 1977).

Recognizing the need to change and to innovate, is only the first part of the strategic planning process. Many companies struggle to react swiftly and take appropriate action in the context of radical innovation. Dealing with organizational inertia is another major research stream within organizational change. One common reason for inertia is that although managers recognize signals from the environment, they fail to build the appropriate organizational capabilities (Tripsas & Gavetti, 2000). In this sense, it is also important to distinguish between radical and incremental innovation, which require quite different strategies (Ettlie, Bridges, & O’Keefe, 1984).

### 4.3 Organizational Science Perspective

As can be seen from Table 4, research within the OS domain focuses on the entire change process, and the effects and challenges that occur. Very few publications within the scope of this research deal with the initial planning phases.

Within the OS domain, a stronger research focus on organizational change is directed towards the entire workforce rather than on the top management as responsible for executing the change. An organizational change strategy can also be designed and conducted by a dedicated team that is formed regardless of position and hierarchy (Higgins, Weiner, & Young, 2012). This perspective was often found to be missing within the IS and MS domains. Within the OS perspective, specifically the interplay of managers, leaders, and the workforce is of great interest (Waldman & Javidan, 2009). While top management is still important in terms of leading the process, employees shape organizational routines and behaviors (Becker & Zirpoli, 2008; Sagie & Koslowsky, 1994) that significantly influence how change processes are conducted. The ubiquity of technology has also led to a democratization of the innovation process, allowing more employees to participate in a distributed and heterogeneous innovation process (Yoo, Boland, Lyytinen, & Majchrzak, 2012).

The current context of change evidently does not play a big role in research, with change usually being seen an evolutionary process, and no publications specifically focusing on radical changes were found.

### 5 Discussion

The results from the literature review on strategy formulation in organizational change reveal some common elements, but also some differences across the domains.

Within the IS-domain, the perspective of information systems has changed from a solely functional and process-oriented one to a broader strategic role. Therefore, a solid understanding of the dynamic development of digital technologies and its utilization is
required within the strategy formulation process. The perspective of the management &
strategy domain of the fuzzy front-end is that it is often caused by external changes to which
the company needs to react, whereby the top manager is mostly responsible for making sense
of industry signals and initiating a viable strategy. However, organizational inertia often
hinders the change process. The perspective of the OS domain is that strategy formulation is
more a collaborative process than the task of the top executives.

This analysis has shown that the phase of recognizing the need to change, making sense of
signals from the environment and initiating a change strategy is partially covered in research.
Yet, this initial phase, although extremely important, since it builds the foundation for the
implementation of change, receives comparably little attention from researchers. As a result, I
propose that applying the concept of the fuzzy front-end (FFE) from the new product
development domain into organizational change research can provide a fruitful new avenue
for research. In digital transformation, a radical and disruptive change for the organization, a
different strategy is needed than for evolutionary or incremental innovations (Ettlie et al.,
1984).

The concept of the fuzzy front-end is appropriate for describing the initial phase of digital
business transformation, as well as in product innovation, since the main characteristics are
quite similar. The process is often perceived as ill-defined, random and mysterious (Rhea,
2003). This also applies to the initiation of a digital transformation strategy, where research is
still needed to cover the specific requirements of digital transformation (Matt et al., 2015). In
digital transformation and other organizational change processes, the first step is to
understand the need for change and develop possible options. Many managers aim at
continuous innovation and change within the organization (Brown & Eisenhardt, 1997), but in
reality, it can be observed that innovative strategy appears in different cycles of “short
sprints”, as well as major reorientations (Mintzberg & Waters, 1982). Hence, a promising
avenue for further research is to explore and explain patterns and procedures that may reduce
the fuzziness and bring more clarity to the front-end stage of the transformation process. One
step in improving the fuzzy front-end is understanding and improving the information flow and
knowledge transfer, in order to improve the interpretation of external signals and ensure a
sufficient information flow between hierarchies. Since this research has revealed that sense-
making and information processing are of great importance in organizational change
strategies, further contributions might look into how this can be applied to the specific
requirements of digital transformation. Another promising field for more research might be to
explore the appropriate roles and responsibilities in the fuzzy front-end of digital
transformation strategies. In digital transformation, multiple areas of the organization are
affected, and therefore, multiple roles and different hierarchies might be involved in this
process and in strategy formulation.
6 Conclusion

Although practical experience demonstrates that the beginning of a transformation process is extremely important, this present research has exposed a gap in the body of knowledge on strategy formation. As a limitation, it should be stated that the research only took publications from highly ranked journals into account. While it can be assumed that the top publications are representative of the important topics generally discussed in each this may still lead to a restricted view, so that including more publications from other journals could possibly change the conclusions drawn. A second limitation is that the publications have been assessed based on their abstracts. Depending on the quality and the comprehensiveness of the abstracts, it may be that important information was omitted or that the paper was miscoded. However, hopefully the restriction to highly ranked publications will mean that in fact the quality of the abstracts is sufficient to correctly code the papers and ensure the soundness of this research.

Drawing on the perspective of the fuzzy front-end, a concept popular in product innovation, this paper has developed new avenues for further research on both organizational transformation and strategy development. Identifying patterns within the FFE may help decision makers to overcome the uncertainties and confusion characterizing this phase and to develop viable strategies for actively designing the transformation process.

References


## Appendix 1 – Selected journals for the literature review

<table>
<thead>
<tr>
<th>Information Systems Basket</th>
<th>Organization Science Basket</th>
<th>Management / Strategy Basket</th>
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<tbody>
<tr>
<td>European Journal of Information Systems</td>
<td>Organization Science</td>
<td>Science</td>
</tr>
<tr>
<td>Information Systems Research</td>
<td>Journal of International Business Studies</td>
<td>Econometrica</td>
</tr>
<tr>
<td>Journal of Information Technology</td>
<td>Organizational Behavior and Human Decision Processes</td>
<td>Academy of Management Journal</td>
</tr>
<tr>
<td>Journal of the Association of Information Systems</td>
<td>Organizational Research and Methods</td>
<td>Academy of Management Review</td>
</tr>
<tr>
<td>MIS Quarterly</td>
<td>Journal of Economic Behavior and Organization</td>
<td>Management Science</td>
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<tr>
<td>Mathematical Programming</td>
<td>(The Journal of Strategic Information Systems) 1</td>
<td>Strategic Management Journal</td>
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<tr>
<td>INFORMS Journal on Computing</td>
<td>Personnel Psychology</td>
<td>The RAND Journal of Economics</td>
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<td>Leadership Quarterly</td>
<td>Experimental Economics</td>
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1 The Journal of Strategic Information Systems is listed for both IS and OS baskets. The author decided to consider it as an IS journal for this research, therefore duplicate publications have been removed from the OS basket.