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Abstract:

Forty years ago, Bo Hedberg and Sten Jönsson proposed the notion of semi-confusing information systems as a desired state for organizations operating in dynamic environments. Core to the idea was that mere efficiency is not enough for long-term success, but that organizations also require a certain amount of inefficiency. These ideas resonate within the growing literature on organizational ambidexterity, in which the dynamic balancing of exploration and exploitation is deemed a prerequisite for long-term performance. This study utilizes the design characteristics of semi-confusing information systems as a lens for secondary analysis of a case of new product development in a global, automotive organization. The findings show that inefficiencies in the new product development process correspond to the proposed design characteristics of semi-confusing information systems, opening up for a new take on the role of inefficiencies in the enactment of ambidexterity. The identified inefficiencies are manifested in unsanctioned repertoires which result in increased variety. In addition, the level of compliance with semi-confusing information systems characteristics is found to impact both the ambidextrous balance and the decentralization of the enactment of ambidexterity.

Keywords: Inefficiency, Ambidexterity, Enactment, New product development.

1 Introduction

“A system – any system, economic or other – that at every given point of time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at no given point of time...”

As noted by Schumpeter (1942, p.83), organizations are perpetually stuck in a present reality where they optimize operations while at the same time thinking strategically and focus on the future. Previous research identifies trade-offs between the two objectives (Adler et al., 2009; Hannan & Freeman, 1977; Luger, Raisch & Schimmer, 2018; MacDuffie, 1997; Salovaara, Lyytinen & Esko, 2019; Suarez et al., 1996), and an array of perspectives such as dynamic capabilities (Teece, Pisano, & Shuen, 1997; Liang et al., 2017), strategic agility (Lee et al., 2015) and organizational ambidexterity (March, 1991) have been proposed to circumvent said trade-off.

One largely over-looked contribution addressing this trade-off was presented in 1978 by Bo Hedberg and Sten Jönsson. The paper defines the notion of “semi-confusing” as a sign of merit for information systems. According to Hedberg and Jönsson (1978), organizations acting in an unstable environment are in more need of destabilization than stabilization (i.e., they need systems designed to afford doubt rather than certainty). For these organizations, it would be more warranted to pursue a design of systems that allows for ambiguity and uncertainties rather than clarity and perfect knowledge. To put it bluntly: organizations acting in dynamic environments need to be endowed with a certain amount of inefficiency.

This line of argument regarding the need for inefficiency is also a tenet of the organizational ambidexterity literature (March, 1991; Raisch & Birkinshaw, 2008). According to this research stream, organizations are involved in a continuous balancing of exploitation and exploration. Following Benner & Tuschman (2003) and Xue, Ray & Sambamurthy (2012), we equate exploitation with *efficiency*, through seeing it as continuous improvements of existing services and processes. Exploration is equated with *innovation* through seeing it as initiatives for the acquisition and development of radically new knowledge and service concepts.

Recent findings from the field of organizational ambidexterity stress that the balancing of exploration and exploitation is in essence dynamic (i.e., ambidexterity is not a fixed state), and that it needs to be approached from the perspective of enactment rather than organizational design (Luger, Raisch & Schimmer, 2018; Zimmermann, Raisch & Cardinal, 2018). Reverberating the literature in the IS control field and its recurring calls for a focus on control enactment rather than configuration (Wiener et al., 2016; Remus et al., 2020), there is an expressed need for additional research into how ambidexterity is enacted.

Our exploratory study investigates an alternative approach to understanding the enactment of ambidexterity. This alternative approach is based on a re-imagining of inefficiencies not as bugs but rather features in the enactment of ambidexterity. As we argue, inefficiencies play a potential role in balancing, yet this perspective is void in much of the previous literature. Through utilizing a revised version of Hedberg and Jönsson (1978), we develop an investigatory framework to identify and analyze inefficiencies. Instead of perceiving these as sub-optimal states, we study how they may act as design characteristics of a semi-confusing information system (SCIS), constituting mechanisms for how ambidexterity may be enacted in dynamic environments (Hedberg and Jönsson, 1978). The research question guiding this study is:

How can a semi-confusing information systems perspective on inefficiency inform our understanding of the enactment of ambidexterity?

The study responds to a call for empirical research by Stokes et al. (2015) suggesting the need for additional studies of boundaries between explorative and exploitative behavior, as well as the dynamic approach to ambidexterity as found in Zimmermann, Raisch & Cardinal (2018) and Luger, Raisch & Schimmer (2018) and their calls for further studies on the enactment of ambidexterity. The study contributes to research by offering an alternative perspective on inefficiencies, intended to aid future studies on how organizational ambidexterity is enacted. This perspective attributes inefficiencies with a new role in the balancing of exploration and exploitation, and offers a potential avenue for future studies.

This study is operationalized through a secondary analysis of data (Bishop, 2016) collected during the case study of a new product development (NPD) process and its transformation at RT Inc., a large, and well-established global automotive firm. The automotive industry is undergoing significant and disruptive changes as a result of new technologies (Pavlinek, 2020), as well as changes in the way customer's use

transportation and mobility services (Grieger & Ludwig, 2019). In this highly dynamic environment, NPD plays a critical role (Kyriazis et al., 2017, Massey and Kyriazis, 2007, Mathew et al., 2010). The research team participated in the NPD transformation initiative at RT Inc., tasked with identifying inefficiencies in the existing NPD process. The resulting analysis from the research team's work was instrumental in the re-design of the NPD process at RT Inc. in 2017.

The paper is organized as follows. After this brief introduction, the Literature and conceptual background section includes a review of inefficiency and organizational ambidexterity, as well as a revisiting of Hedberg and Jönsson (1978) work. In the Method section, we present the underlying study and the secondary data analysis. In the Results section, the identified inefficiencies in the NPD process are presented as SCIS design characteristics. Finally, the Discussion section provides a general discussion of findings and a separate section on how the study informs research within organizational ambidexterity.

2 Literature and Conceptual Background

2.1 Inefficiency and Organizational Ambidexterity

“Never before in [sic] history of the West have organizations been as standardized and unresponsive to contingencies as they are today, despite assertions to the contrary.” Kallinikos, 2011, p. 57.

Previous studies have largely treated inefficiency as a fallout of sub-optimization. The underlying notion of efficiency (i.e., the relationship between input and output in which an increase in the output/input ratio is equated with increased efficiency [Brunsson, 2017]) is laden with deterministic assumptions. The idea that there is complete intentionality in terms of which outputs are desirable in the short- and long-term has long been dismissed by a variety of researchers, including researchers in both neo-classical (Schumpeter, 1942) and behavioral economics (Cyert & March, 1963; Thaler & Sunstein, 1999).

Treating efficiency and inefficiency as end-poles of a dichotomy has pushed research into a situation in which inefficiency is invariably regarded as something to be avoided and inherently bad. Efficiency, on the other hand, is the desired state, in which operational performance is maximized while being measured and controlled. This interpretation is fundamentally challenged from the organizational ambidexterity perspective (Gaim & Wåhlin, 2016; Xue, Ray & Sambamurthy, 2012). Instead of viewing efficiency as the single, optimal outcome of an organization directly related to the efficient exploitation of existing opportunities (Birkinshaw, Zimmermann, & Raisch, 2016), research within this stream treats it as intermittently a dichotomy and a dualism (Ask, Magnusson & Nilsson, 2015; Farjoun, 2010). Efficiency and innovation (exploitation and exploration) are two desirable states, in which an organization needs to be simultaneously equipped with capabilities for both. In addition, increased dynamism in the business environment would lead to an increased need for innovation (i.e., diminishing returns on increased efficiency [Ahuja & Lampert, 2001]) and increasing returns on balancing (Luger, Raisch & Schimmer, 2018; Zimmermann, Raisch & Cardinal, 2018).

From this perspective, the issue of inefficiency may (if we accept the stance of dichotomy) be juxtaposed against efficiency and interpreted as a proxy of innovation (for a more nuanced elaboration on this, see Benner & Tushman, 2003). This perspective is reiterated in the literature surrounding organizational slack (Bourgeois, 1981; Mousa, Chowdhury, & Gallagher, 2017; Stock et al, 2019; Tan & Peng, 2003), in which slack itself may be regarded as a vestige of innovation.

In a recent study of innovation practices at the Swedish Tax Agency, Magnusson, Koutsikouri & Päiväranta (2020) identified slack in the form of what they refer to as shadow innovation (i.e., unsanctioned innovation activities), constituting 20% of the total IT expenditure of the agency. The shadow innovation in this case is directly translatable into inefficiencies yet deemed instrumental for the organization to achieve long-term legitimacy and relevance through what may be referred as unsanctioned buffering (Thompson, 1967). Other studies of this type of unsanctioned innovation activities are found surrounding the notion of skunk works, based on the empirical work in Lockheed Martin in the 1990s (Miller, 1995; Rich & Janos, 2013). Here, the organization is dependent upon unsanctioned innovation for its long-term success, yet the negative fallout related to the innovation not becoming institutionalized, identified, or scaled (Huang et al., 2017) is directly translatable into sub-optimization.

To summarize, the necessity for organizations to simultaneously exploit and explore strengthens the need for addressing negative consequences of a sole pursuit of efficiency. When innovation (exploration) is coupled with inefficiency, an increase in efficiency may directly result in a decrease in innovation and may

therefore be detrimental to long-term organizational sustainability. Hence, a more nuanced understanding of inefficiency is needed within the study of organizational ambidexterity.

2.2 Semi-confusing Information Systems Revisited

“Current information – and accounting – systems do more to stabilize organizations than to destabilize them. They filter away conflicts, ambiguities, overlaps, uncertainty etc. [sic] and they suppress many relevant change signals and kill initiatives to act on early warnings.” (Hedberg & Jönsson, 1978, p. 47)

Hedberg and Jönsson (1978) approach the role of information systems from the perspective that they may not adequately support an organization’s long-term intent. Instead of seeing information systems merely as stabilizers, they open up the possibility of exploring a new role of information systems as beneficial destabilizers.

As seen in Table 1, Hedberg and Jönsson (1978) offer a set of design characteristics coupled with the needs they see as common within organizations operating in dynamic environments. Based on the purposeful sampling of the last ten years of management literature, we include examples of approaches and/or cases that illustrate how the design characteristics are visible in contemporary practice. As seen, the need for what Hedberg and Jönsson called “semi-confusing” is still relevant and acknowledged in practice.

Table 1. Overview of a Selection of the Design Characteristics of SCIS, from Hedberg and Jönsson (1978, p. 61)

Design characteristic	Implication/ Description	Examples
Variety in communication	Organizations need to establish multiplicity in communication (with redundancies and alternatives constantly evolving) rather than formalized routines for decision-making and reporting.	Social media and the transparent enterprise (McAfee, 2006). Role ambiguities, short-circuiting levels or groups, and collective intelligence (Bonabeau, 2009). Netflix used a contest to design and develop a better recommendation engine (Bonabeau, 2009).
Variety in perception	Analysis needs to be based on individual or group perceptions rather than on global templates and uniform reference models.	Interactive data visualization based on cognitive profile (Dilla, Janvrin & Raschke, 2010). IBM is now applying design thinking not only to product development but also to business design (Kolko, 2015). Samsung incorporated strategic understanding into their design team processes and decentralized strategy execution (Yoo & Kim, 2015).
Variety in evaluation	Objectives and evaluation criteria need to be ambiguous and pluralistic rather than comparable (over time and space) and clear.	Deloitte took a new approach to compensation with a shift from day-to-day to quarterly and per-project “performance snapshots” (Buckingham & Goodall, 2015). Scheduled end-of-day written reflections and communication of said reflections to colleagues drove performance at a Bangalore call center (Beshears & Gino, 2015). Algorithms outperformed human judgment by 25% in recruitment (Soll, Milkman, & Payne, 2015).

Hedberg and Jönsson (1978) call for increased variety as a path to destabilization. Through introducing (and accepting) variety in communication, perception, and evaluation, the organization may be expected to demonstrate increased ambivalence and uncertainty in management. This, in turn, can lead to increasing pluralism and expanded repertoires of analysis, which may result in increased capabilities for competing in a dynamic environment.

3 Method

3.1 Empirical selection

Our paper is based on a case study of NPD in Rolling Thunder Inc. (RT Inc.), conducted in the period from 2014-2016. RT Inc. is a public and well-established automotive manufacturing firm employing approximately

100,000 employees in the period studied. RT Inc. was spending about 5.5% of their net revenue on R&D. Most of their R&D was at the time done in-house rather than being outsourced. The NPD process of RT Inc. was selected as an object of study since it is assumed to require a careful balancing of efficiency and innovation. Over-spend on innovation may theoretically result in increased time to market and sunk-cost, where over-spend on efficiency may decrease the degree of innovation and reorient organizational attention from achieving sustainable competitive advantage in dynamic markets, recently subjected to significant disruptions.

The automotive industry has been going through significant and disruptive changes due to the new technologies such as electrification, self-driving cars, and telematics (Athanasopoulou et al., 2019). The industry is also experiencing significant changes in consumer demand because of shifting preferences in favor of purchasing services rather than opting for the traditional automobile ownership model (Grieger & Ludwig, 2019). Consumers have changed the way they use transportation and mobility services and automotive organizations have started to address organizational challenges to prepare for selling services as opposed to selling products (Genzlinger, Zejnilovic & Bustinza, 2020; Svahn, Mathiassen & Lindgren, 2017). These disruptions have resulted in overall more competitive and dynamic automotive markets. Additionally, these changes fundamentally disrupt older manufacturing organizations traditionally grounded in a strong engineering culture (Pavlinek, 2020). In summary, the more dynamic global automotive industry is under pressure to reorient their business models, improve their responsiveness to changes in customer value and overall markets, and align various stakeholders around the same goals.

RT Inc. as well as other automotive organizations are responding to these pressures by focusing on the role of NPD and its importance for building competitive advantage and financial success (Petrillo, De Felice & Zomparelli, 2019). At the time of the study, RT Inc. was also lagging behind other known automotive brands on upgrading their product lines and models. The organization was therefore at the time of the study focused on refreshing their products, and using the introduction of new models to position themselves in the premium markets. The number of cars at RT Inc. sold globally was relatively small compared to market leaders (e.g.: Toyota, etc.) and their new vehicle sales accounted for a significant part of their overall sales further highlighting the importance of choices regarding model and options designs for the future success of RT Inc.

NPD in organizations encompasses many activities and processes, which span an entire organization and are grounded in the need for collaboration and cooperation across different functions (Kyriazis et al., 2017, Massey and Kyriazis, 2007, Mathew et al., 2010). Due to the disruptions and dynamics in the automotive industry, NPD has taken on a heightened importance and a critical factor of future success (Petrillo, De Felice & Zomparelli, 2019). The leadership team at RT Inc. shared with the research group the necessity to build a broader understanding of their NPD function and its inefficiencies as part of their transformation initiative to address changes in their industry environment. It is in this context of a heightened importance of NPD at RT Inc., and the dynamics in the automotive industry that the research team decided to choose this organization for a case study of SCIS.

3.2 Data collection

The research team studied the potential for improvements and transformation of the NPD process at RT Inc. While many different approaches can be used to gather case data, we used the methodology developed by Yin (2017). At the core of Yin's approach is a careful documentation before, during and after the study. Additionally, when the documentation is built on a well-defined set of protocols and research questions, the case methodology can provide reliable findings, which can support theory building (Eisenhardt, 1989).

The data collection consisted of a series of semi-structured interviews, meetings, and workshops. In addition, a secondary qualitative data analysis approach was used (Bishop, 2016; Heaton, 2008). The research team identified and collected NPD process and protocol related documents. Access to the various functional areas of the organization secured all necessary documentation to study design characteristics of the NPD and activities across all relevant stakeholders.

The research team was very familiar with RT Inc., having collaborated with the organization on a number of previous research projects. This collective experience and understanding of the organization led to the development of contextual knowledge valuable in interpreting the data collected (Yin, 2017). The research team had direct access to two key actors coordinating the project. The steering group consisted of six C-level managers, who in close collaboration with the research team defined the project scope. In addition, the steering group and the researchers jointly identified decision-makers with key NPD roles to participate

in the interviews. The research team also had access to ten additional C-level managers in charge of line organization functions as well as having leadership roles in the NPD transformation initiative.

The research team conducted 37 individual semi-structured interviews (51.4 hours of data) based on a defined protocol and with open-ended questions. Each interview lasted from 60 to 120 minutes in length. Most of the interviews took place between the summer of 2014 and the spring of 2015. The interviewees represented a cross-section of responsibilities across key functions involved in NPD at RT Inc. (Table 2). Special attention was placed on assuring that the research team incorporated critical stakeholders from R&D, Marketing, and Manufacturing functions. All interviews and meetings were recorded and transcribed verbatim (917 pages).

Table 2. Interviews Conducted

	Marketing	Product strategy	Design	R&D	Manufacturing	HR	Finance
Vice President	0	2	1	3	2	2	0
Director	4	0	0	4	1	0	2
Manager	4	1	0	2	2	0	0
Operations	2	0	0	5	0	0	0
Total	10	3	1	14	5	2	2

The collaboration process with the steering committee was iterative and provided a rich opportunity to shape the scope based on the project learning and the internal unfolding of the transformation initiative. Project statuses and tentative results, based on interviews and documents collected, were presented and discussed in 11 meetings and 4 workshops. Detailed notes were taken in each workshop. Each workshop lasted 2 to 3 hours and yielded additional documentation, such as collective identification of pain points and obstacles in the NPD, scenario formulation regarding communication and future organizational and other options. The implications of these additional findings were extensively discussed to assess how useful the new information was and whether management of the NPD would be impacted. This closeness to the study object additionally supported the development of contextual knowledge and decreased the risk of loss of context and ethical concerns relating to the re-use and reporting of data (Bishop, 2016).

Next, in collaboration with the steering committee, the research team identified gaps in information and addressed these gaps through additional data collection. Notes from the workshops conducted by the research team were studied. Additional internal documentation and protocols pertaining to the NPD processes and communication were received from 14 interviewees/respondents.

3.3 Method of Analysis

The design characteristics of SCIS (Table 1) from Hedberg and Jönsson (1978) were applied as a framework for the secondary analysis of the collected data from the NPD process at RT Inc. Through re-interpreting inefficiencies identified in the NPD process as instances of means to achieve variety, we analyzed how these act as destabilizers and not solely sub-optimal states. The analysis involved three sequential steps.

3.3.1 Step 1: Data Exploration

The interview data and documents about NPD didn't lend themselves to statistical testing. Statistical testing was also not the purpose of this study, rather the aim was to use empirical observations and text analysis from the case study research in combination with existing literature to develop a more nuanced understanding of the role of inefficiencies in the NPD at RT Inc in order to support theorizing. The research team proceeded with text analysis of interview text data to further explore varieties of communication, perception and evaluation across the NPD related areas and stakeholders at RT Inc. This text analysis facilitated an understanding of emerging themes resulting from the interviews (Silverman, 2015).

3.3.2 Step 2: Coding

The research team employed the text and word-count analysis to identify key themes and perspectives in the NPD process at RT Inc. (Braun & Clarke, 2006). All the interview data (37 interviews) were repeatedly

read and coded using ATLAS.ti software. The initial descriptive results were based on 48 codes with 1,378 quotations and 3,814 instances of word use.

The research team developed protocols and guidelines for coding the interview data. Table 3 presents a sample of codes with their synonyms used to catch every occurrence of a specific code used:

Table 3. Sample of Codes, Descriptions, and Synonyms

Name of Code	Description	Synonyms
COMPETITORS	Names of competitors	Market dynamics, market share erosion, reference price, price changes, price competition, benchmark, competitive behavior
CUSTOMER	Every time the word customer is used or customer definition in different contexts	Customer, customer trends, customer data, customer behavior, customer definition, customer feedback, everything recorded that includes the word customer
VALUE	Everything recorded that includes value, both as customer value but also value in other terms	Value creation, value definition, value perception, brand value, brand identity, perceived value, creating and capturing value via processes for customers, creating value for the company by lowering costs, decreasing lead-time.
BUSINESS PERSPECTIVE	Business case, product strategy	Business plan, car project/program, commercial focus, business group, business driven, business logic
PRICE	Every time price is mentioned	Price, Pricing methodology, value-based pricing, reference price, willingness to pay, ability to pay, pricing options, transactions price, price information, price elasticity, price list, price mix, price position, pricing perspective, price point, list price, pricing policy.
ATTRIBUTES/ FEATURES	Various product attributes, characteristics/features	Safety, luxurious, innovative design, quality
OPTION PACKAGES	Every time option packages are mentioned by respondents	Right option packages, trim level, seat comfort, climate comfort, bundled features, options offered to customers as add-ons
FUNCTIONS	Various functions in the organization	Marketing, finance, product strategy, product design, manufacturing, R&D
REVENUE	Discussing price and volume with resulting revenue implications	Revenue target, sales target, sales, marketing goals, revenue management, revenue perspective
COST	Anytime the word cost is used	Cost focus, product cost, material cost, standard cost, pure cost, examples of indirect and direct cost, direct impact on cost, cost target, cost reduction, cost awareness, cost modeling, cost plus, cost perspective
PROFITABILITY	When profitability is discussed directly and indirectly or in relation to cost and revenue	Profit, profitability, lowering costs and improving profitability, improving revenue and profitability, profit margin, profitable product line
FINANCE	Anytime the word finance is used by the respondent	Financial, finance, finance director, budgeting, commercial program, financial amount, financial perspective, financing a project
VOLUME	Anytime the word volume is used by the respondent	Volume target, volume expectations, trends in sales volume, national sales, sold cars in different geographies/by model, volume planning, volume mix
BALANCE	Balancing between value and cost, creating value for the customer and the organization	Balancing, financial balance, balance in volume, as well as balancing efforts (balance between value, cost and time), responsibility for balancing features to capture customer value and creating value for the company, balancing processes

After coding, a code concurrence check was performed. All “irrelevant” and duplicate codes were eliminated, and only the unique codes were included in the final analysis. The final word code selection was reduced to 14 codes (competitors, customer, value, business perspective, price, attributes/features, option packages, functions, revenue, cost, profit/profitability, finance, volume, and balance). Additional codes pertaining to ‘information gaps’ and ‘informational flows’ were also included.

In identifying the 14 codes, the perspectives of different functions and stakeholders and their roles in the NPD process were deemed of importance. For example, it was expected that the finance department’s focus would be on finances, profitability and the business perspective of the new product/service initiative. The research team also expected that the text analysis emerging from the marketing division would be focused on customer value and competitors. In performing the text and word-count analysis, the researchers focused on analyzing how the occurrence of these 14 codes differed across the functions. This enhanced understanding of various perspectives, concerns, as well as potential gaps and inefficiencies in NPD at RT Inc.

The secondary data analysis (Bishop, 2016) was conducted in two steps. First, identifying concurrences with SCIS design characteristics in the interview data. Second, we categorized the identified accounts into the design characteristics categories from Hedberg and Jönsson (1978). The research team supplemented the word-count interview data with workshop notes, internal documentation and protocols to analyze the identified design characteristics in the organization. These additional documents provided important information about the various contexts across different functions, and their varied concerns (Yin, 2017). Table 4 contains an overview of inefficiencies/design characteristics, examples of codes and level of analysis.

Table 4. Design Characteristics, Data, and Level of Analysis

Inefficiency/ Design characteristic	Examples of codes highlighting design characteristics	Level of Analysis
Information gaps	Information sharing, information systems	By function
Asymmetric information flows	Industrial vs. commercial system	By function
Conceptual fluidity	Customer value	By function
Value ambivalence	Use of ‘customer’ across functions	By role and by function
Distorted responsibility	Value/cost balancing	By function
Lack of accountability	Gates in a stage-gate system	By gate status and time

3.3.3 Step 3: Validation

Two of the researchers performed readings and code checks to ensure consistency in the coding. In addition to this, five interviews were coded in parallel by the same two researchers, with the results showing consistency (>95%). A joint review by the researchers and steering committee members of RT Inc. resulted in consensus that the selected codes were descriptive of the relevant themes emerging from the interviews.

4 Results: Semi-confusing Design Characteristics at RT Inc.

The results are presented in relation to the identified inefficiencies in the NPD process at RT Inc. These are organized following the framework of SCIS design characteristics as proposed by Hedberg and Jönsson (1978).

Table 5. Identified Inefficiencies and Their Links to the Design Characteristics of SCIS

Design characteristics	Description	Identified inefficiencies
Variety in communication	Organizations need to establish multiplicity in communication (with redundancies and alternatives constantly evolving) rather than formalized routines for decision-making and reporting.	Information gaps Asymmetric information flows
Variety in perception	Analysis needs to be based on individual or group perceptions rather than on global templates and uniform reference models.	Conceptual fluidity Value ambivalence
Variety in evaluation	Objectives and evaluation criteria need to be ambiguous and pluralistic rather than comparable (over time and space) and clear.	Distorted responsibility Lack of accountability

4.1 Variety in Communication

4.1.1 Inefficiency 1: Information gaps

The valuable customer information doesn't reach the Product Strategy. (Director, R&D)

We definitely miss information about the customer, and that's why we do our own customer studies when we're able to. (Manager, R&D)

First, the word-count analysis identified information gaps across all functional areas in the organization. As shown in Table 6, information gaps were most frequently reported within the R&D and Manufacturing functions, and the least frequently by Marketing and Product Strategy. More than half of the respondents (54%) mentioned that they experienced information gaps in their decision-making.

Table 6. Gaps in Information Sharing at RT Inc. by Functional Area

Function	Information gap (%)
Marketing	30% (10)
Product Strategy	33% (3)
R&D	79% (14)
Manufacturing	67% (6)

These reported gaps provide an initial illustration of concerns in the organization regarding the availability of appropriate information for decision-making and, as a result, potential inefficiencies. If NPD process is intentionally ambiguous to accommodate changes in the customer value and competitive environment, then various stakeholders need another source of information to understand how to design new products. Information gaps may result in delays due to the need for additional time and effort to complete tasks and make decisions or may lead to critical product development functions using inadequate or dated information to make product development related decisions.

4.1.2 Inefficiency 2: Asymmetric information flows

Sometimes the communication between Purchasing and the project isn't good enough, and we risk buying things that in the end are too expensive to actually put in the products. (Vice President, Manufacturing)

In order to better understand how information flows were impacting all relevant areas of the organization, the research team further explored the magnitude and direction of the information flows.

At RT Inc., the Product Strategy function is defined as the NPD business case owner. In this role, Product Strategy is responsible for the product definition and all the NPD related processes; it serves as a bridge between the commercial (marketing) and industrial (R&D and manufacturing) functional areas. R&D function at RT Inc. includes product design as well. The Product Strategy also defines and monitors the benchmarks (e.g.: gates) to be reached at every NPD stage. Using the documentation pertaining to the processes and protocols facilitating information sharing across the organization, the research team laid out the NPD framework (Figure 2). The research team next analyzed interview data by performing interview text analysis

focused on the count of 'information gaps'. Other words in our preliminary text analysis, such as information, input, gaps, interaction, were strongly correlated with the use of the phrase 'information gaps.'

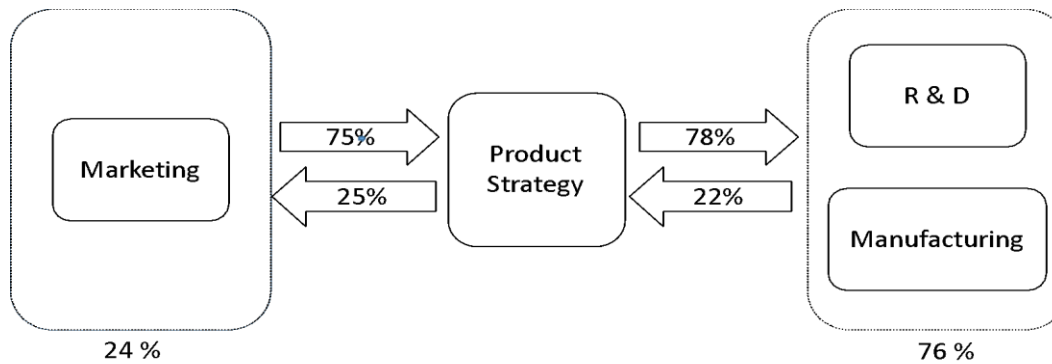


Figure 2. Direction of Information Flows and Information Sharing in the Organization

Figure 2 incorporates the word-count analysis data and identifies the absolute number of internal documents and protocols shared across functions at RT Inc. The words 'information gaps' are used in 76% of instances by R&D and Manufacturing, while 24% of the occurrences are recorded by marketing function. Further, analyzing the total number of documents shared across functional areas, we found that the largest percent of the overall document sharing takes place between Product Strategy and R&D and Manufacturing functions (78%) and between Marketing and Product Strategy (75%). However, the percentage of document sharing between the industrial system (R&D and Manufacturing) and Marketing was significantly lower (22% and 25% respectively) in relation to the total documents shared.

Word-count data and the number of document analyses show that the NPD process (from commercial/marketing to industrial/manufacturing systems) displays information flows predominantly in the feed-forward rather than feed-back information flows. It further shows that R&D, product design and manufacturing functions, seem to be more removed from the timely customer and marketing data. The process are designed in a way that these functional areas are much more likely to be receiving information rather than be co-creators of new products and affecting the conversation regarding NPD.

Table 7. Analysis of Documents Facilitating Information and Knowledge Sharing

Connections between functions	Total documents (as a %)
Product Strategy and R&D	16.45%
Marketing and Product Strategy	15.13%
Manufacturing and R&D	8.22%
R&D and Marketing	6.91%
Design and Product Strategy	6.25%

Additionally, analyzing the total number of documents identified to communicate across functional areas we find that 16.45% of all documents are used to facilitate information and knowledge sharing between product strategy and R&D. The number of documents shared decreases significantly when exploring direct communication between marketing and R&D. Our interview data further indicate significant frustration, especially within the R&D function, regarding the quality and timeliness of information supplied to them by Product Strategy and Marketing, including the lack of opportunities to participate in the NPD discussions. Pushing for increased automation of document/information flows in the NPD process and providing specific opportunities for collaborative value co-creation processes could serve to help decrease information gaps in the NPD process and align the relevant stakeholders around common goals.

4.2 Variety in Perception

4.2.1 Inefficiency 3: Conceptual fluidity

We next performed word-count analysis of the interview data aiming to understand the use of words pertaining to customer value across various functions. This analysis, shows that when respondents mention

value, 43% of word-counts use relate to customer use and 40% of counts of the same word relate to attributes/features. The findings show that the focus on value varies greatly across functions at RT Inc. The occurrence of 'value' is most frequent in Marketing and least frequent in R&D. On the other hand, the words "product attributes/features" are most common within R&D, Design, and Product Strategy. As seen in Figure 3, Marketing is, as expected, most focused on value as measured by the word-count analysis. The prioritization shifts to attributes/features in R&D, Design, and Product Strategy. These functions are tasked to help develop business cases and convert ideas into tangible product options. This shift creates the opportunity for interpretative flexibility within R&D, in which customer value may be reinterpreted and redefined, potentially with a focus on the past rather than the future. The product attributes/features, instead of the overall customer value, become the vernacular of downstream communication about the internal definition of the product and not a means of addressing the specific ideas of how to respond to potential changes in the market.

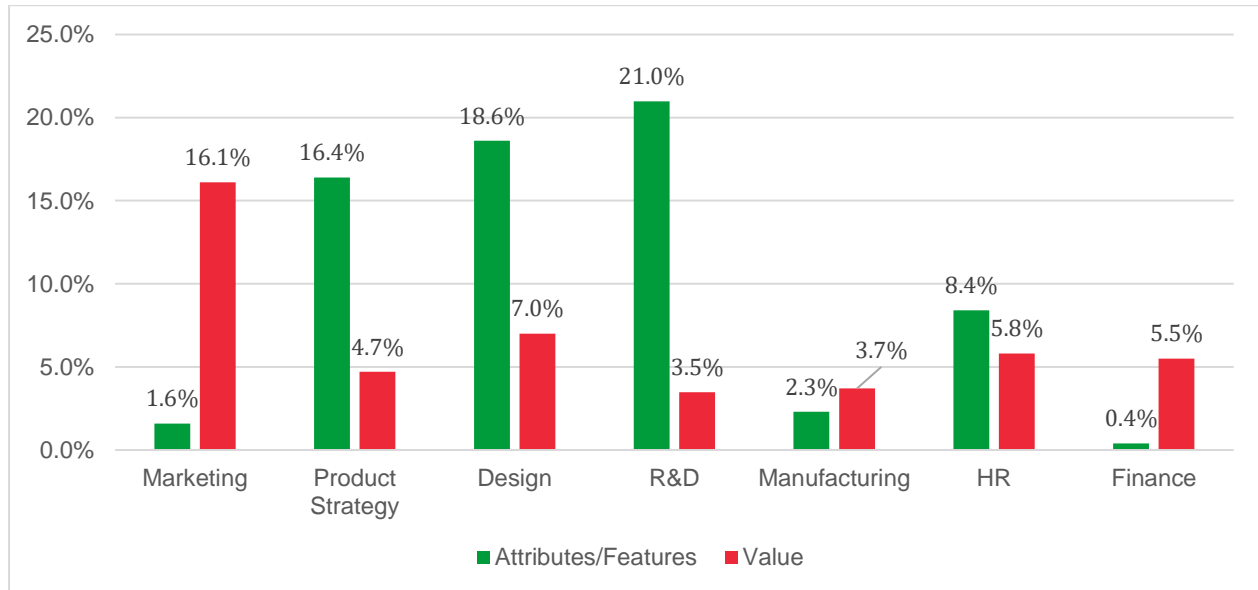


Figure 3. Frequency of Words "attributes/features" and "value" Within Functions

These findings signal a challenge in communicating the specificity of customer value in terms of attributes/features and service components so that these can be easily understood and translated into product definition by R&D.

To address the challenge of asymmetric information related to the customer value, 43% of the R&D respondents in the study mentioned their own initiatives to collect customer information directly in order to be better able to interpret customer value. The interview data indicates that R&D engages in this data collection to compensate for differences in perception to better deliver on attributes/features that align with customer value.

The same word-count data was further analyzed, but this time across all functions (Figure 4). It was found that the focus of R&D on attributes/features and the focus of the Marketing function on value remains as pronounced as in the earlier word crunch analysis within functions. In Figure 5, it can be seen that the R&D focus on attributes/features makes up 69% of the total focus on attributes/features of all functions, while Marketing's focus on value represents 67.8% of the total. The pattern therefore remains the same as in the previous analysis. Based on the word-count analysis

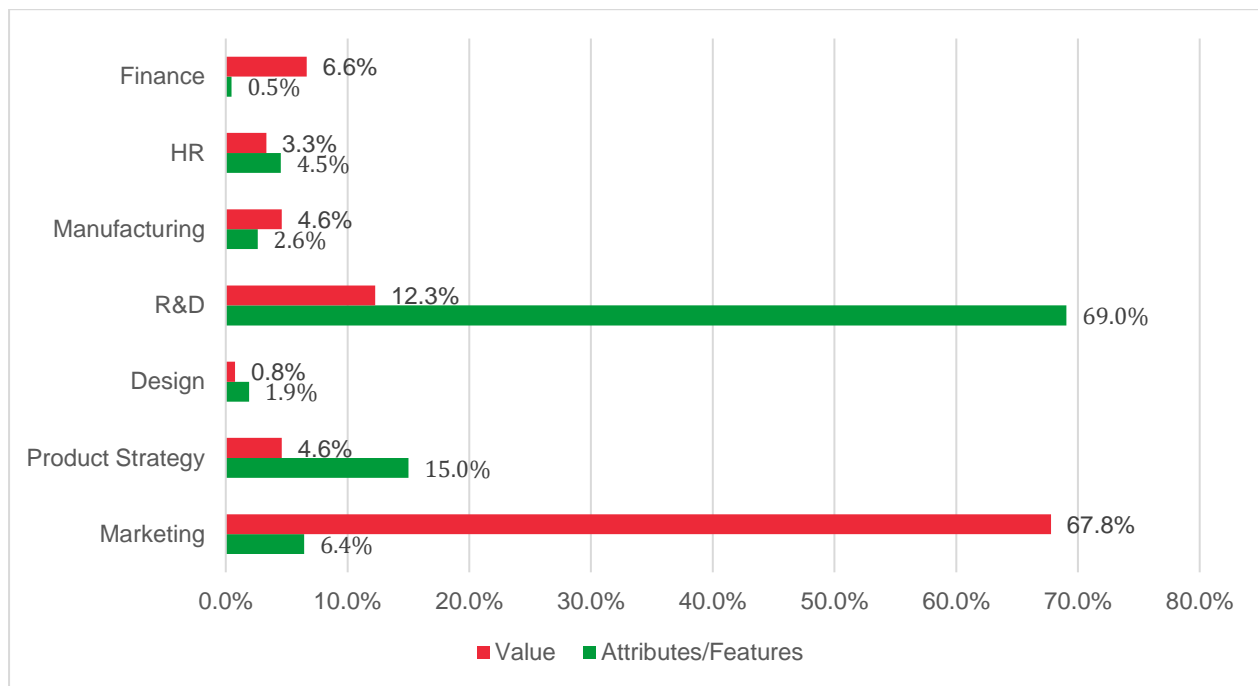


Figure 4. Frequency of the Words 'attributes/features' and 'value' Across Functions

Customer value is in our case most used for external communication of the Marketing function. Hence, it is a vehicle for communicating product-centric information from the ideation and revenue-centric functions in the development process. The absence of customer value as a vehicle for cross-function information flows gives the impression of a telephone/Chinese whispers game, in which a shift occurs from a customer-centric perspective in ideation to a customer-averse perspective in the industrial system back to a customer-centric perspective in finance.

4.2.2 Inefficiency 4: Value Ambivalence

Studying the use of the concepts of value and product attributes/features as a vehicle for information sharing in the organization, we continued to explore how potential responsibility and focus for value vs. attributes/features vary in the organization across managerial layers (from Senior VP to Operations) (Figure 5).

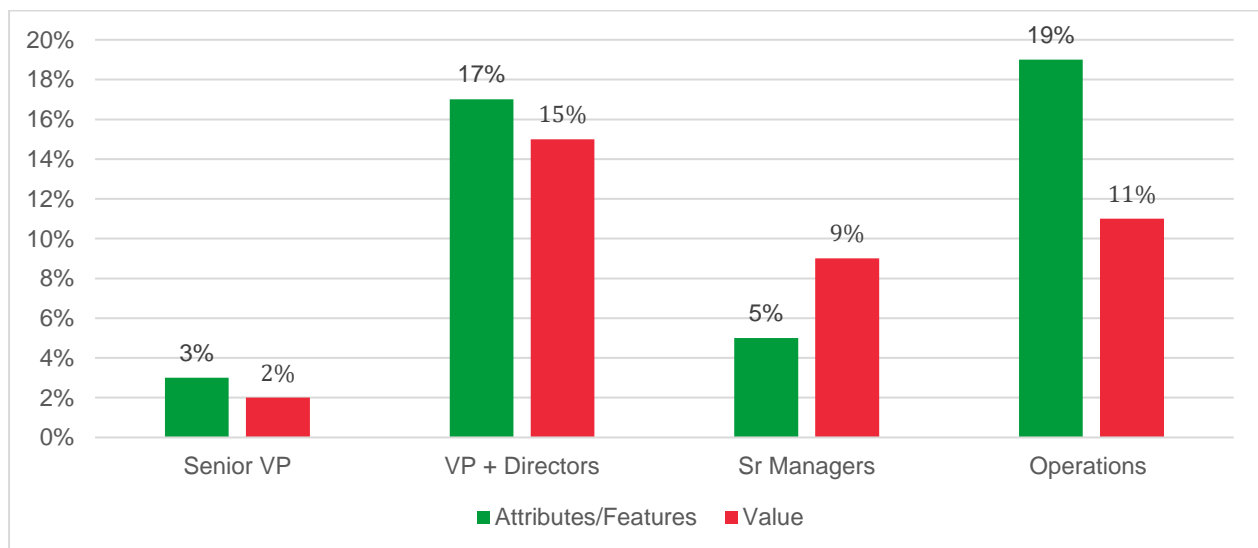


Figure 5. Use of Value and Attributes/ Features by Organizational Role (%)

The word-count analysis at RT Inc. shows that Senior VPs use concepts of value and attributes/features the least. The analysis of their word-count is evenly distributed across the following keywords: customers, finance, cost, and business perspective, which together account for 75% of their interview data. On the other hand, attributes/features are words that are used most by operations. The word-count on value and attributes/features is most balanced and relatively high for the VP and directors.

These differences are to be expected given the variations in the perspectives of different stakeholders. At the same time, RT Inc. operates in a market in which it is making a transition from manufacturing to selling services, and it would be reasonable to expect that the function of Senior VPs would be more focused on value and attributes/features as measured by word-counts. Word-count analysis further suggests that the difference in focus increases as we move toward operations, where the count on attributes/features dominates value, showing the need to understand how to translate the conceptual ideas into concrete products and attributes.

4.3 Variety in Evaluation

4.3.1 Inefficiency 5: Distorted Responsibility

Analyzing interview data, researchers used the unique code of 'balance' to capture the respondents' discussion of balance or in the context of balancing between value and cost. In total, 262 occurrences of these two keywords were identified, and the proportion for balancing was 67.5% with regard to both the product and processes, but with different perspectives.

The unique code for "balance" was interpreted as a proxy measure of the responsibility of stakeholders for balancing between value and cost. More than 50% of the occurrence of word-count for "balance" relates to stakeholders from the R&D department. R&D interview data also indicate the highest frequency of the use of the word "cost." As expected, Finance is most focused on the profitability and Marketing is most focused on the revenue. While these word frequencies are mere indications of the perceptions of responsibilities in the organization and have not been subjected to any statistical testing, they nevertheless point to the differences in the way different functions in the organization view their responsibilities (Table 8).

Table 8. Focus and Perceived Responsibilities (in %)

	Market.	P. Strat.	Design	R & D	Manuf.	HR	Finance
Balance	5.1%	5.1%	2.0%	50.5%	12.8%	4.1%	20.4%
Cost	16.8%	8.4%	0.4%	28.9%	22.2%	3.6%	19.7%
Revenue	45.5%	9.1%	0.0%	9.1%	4.5%	13.6%	18.2%
Profit/ profitability	13.9%	4.9%	0.0%	16.0%	9.7%	0.7%	54.9%

With regard to the different perspectives, respondents from Marketing and Finance also used the word balance but pertaining to the financial balance and their responsibility either in terms of profit or revenue. In Marketing, use of the keywords was also found to describe the benefits of having a balance of profitability in their markets (also mentioning balance in volumes and revenues) and the idea that customer requirements need to be balanced in the NPD process within the industrial system. Finance was in our case identified as the function most concerned with profitability and a balance of revenue and cost.

In the upstream functions (Marketing and Product Strategy), the use of the word 'balance' pertains to the balancing of different product functions and features to match customer requirements. The main concern in these functions is to develop an attractive and competitive product with less focus and concern about cost as indicated by the word-count analysis. The quote below illustrates the respondents' focus on the early stages and less on the realization of their "development order," and also on how responsibility is pushed elsewhere in the organization. The significant differences in perceived responsibilities in different parts of the NPD process at RC Inc. indicate potential challenges in achieving set goals for new products in dynamic markets. Further, these differences in perspectives and perceived responsibilities indicate misalignment of stakeholder goals for the NPD.

In the downstream functions, R&D takes on the responsibility for achieving a balance of value (features and attributes that customers are willing to pay for) and the cost of implementing the customer value.

Yes, the biggest problem we have, without a doubt, it is this balancing of properties and getting the product together. But there is no universal costing attack approach. Almost every single gate you come to... the product costs significantly more than what it may cost... It is chronically so. We can, of course, slim down the contents of the product, so we are going through the gates. But it fits as well with the culture that it is more important that all properties are met than that we keep cost targets. (Manager, R&D)

4.3.2 Inefficiency 6: Lack of Accountability

At RT Inc., NPD activities are organized in and around a project gate system. The purpose of the system is to ensure that a range of business and technical requirements are fulfilled at every stage of the NPD. It is used as a formal planning and control system, but it is also seen as a system for the distribution of accountability. Furthermore, the gate system is used for the coordination of and dialogue regarding actions needed to fulfill requirements. All requirements are expressed in one of four statuses (initiated, preliminary, finalized, and verified) that are intended to support the identification of the current status of the project. The use of the gate concept reflects a metaphor in which the fulfillment of requirements is the key that opens the gate. When a gate is opened, the gate is “green” and the project is allowed to enter the next phase, but when requirements are not fulfilled, the gate should be considered “red.”

The respondents speak about the system in two ways. All respondents make use of the gates to anchor descriptions of their roles, the work they perform, and cross-functional activities and communication. A majority of respondents also speak about the gates as a system of control and/or accountability. The majority of respondents perceive the system to be an “old traditional control system” that is rigid and reactive. One of the more critical respondents even questioned whether any company was able to ever successfully use a stage-gate system and indicated that Rolling Inc. is no exception. A couple of other respondents indicated that it does not matter whether gates are red or green, since the perception is that gates are irrelevant for project control and decision-making. The respondents stated that there is a constant overdraw of cost requirements in the development, which is explained either by too much stretch in the cost targets and/or unclear and fuzzy concepts and product definitions. However, several respondents mentioned that, according to their experience, a project was never actually stopped due to its gate status. Some respondents even laughed and said that they had never seen any gate to be green at the first gate evaluation. The standard operating procedure is to open the gate with some reservation and start looking for solutions in parallel. In highly prioritized cases, unmet requirements have to be addressed by a management board that has to decide on the scope and intent of the project.

The formal gate system may be rigid and ill-functioning with regard to accountability. However, informal solutions are available in order not to fully stop the development process. One solution is to work iteratively in a proactive way, as indicated below.

There are a handful of people who work in the early stages. We know each other well, so it is iteratively everything. I must say that it is not as linear as it appears from a document covering the gate statuses. (Senior/Vice President, Product Strategy)

I mean that the old way to sit and measure if a gate is red or green, it's a bit reactive. Then we will have some red or green [XX laughs] gates. It is better to be a few months ahead and be active and say, 'Yes, what is it that we know we need to do,' and so perhaps we will come closer to green than what we've done in the past. To measure that we are red, it gives nothing. (Director, R&D)

Another way is to pass the (red) gate with restrictions or, since cost overdraw is common, to assign someone to either defend the cost level or reduce costs. Since the gate system is connected to activities in the development process, it also sets the pace for the development organization. As illustrated in Figure 6, the aggregated gate statuses show that a large portion of gates are assessed as red, with peaks early in the year, before the summer and in the late summer. We also observed that 100% of re-gates (new assessments of gates passed with restriction) occur in the beginning of the year and with several peaks over the whole year.

From the pattern, it is evident that the gate system and lack of accountability, in general, create an arrhythmic work pace in the NPD process.

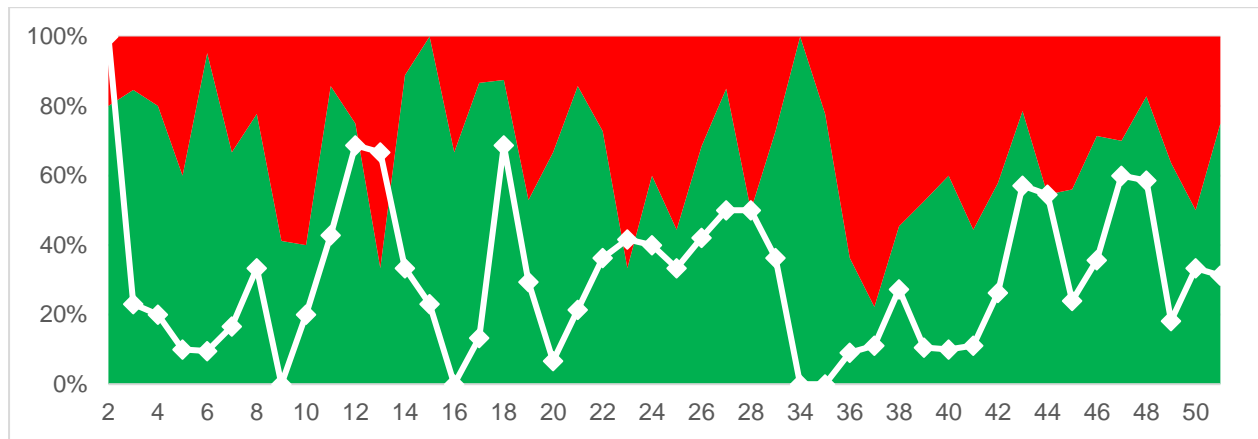


Figure 6. Overview of weekly aggregated gate status (n= 558 gates for 2010-2013) ¹

5 Discussion

Following the framework presented by Hedberg and Jönsson (1978), we have explored the role of inefficiencies as destabilizers, which instill the organization with increased variety in communication, perception, and evaluation. The discussion will focus on how this informs the study of the enactment of organizational ambidexterity. This will be done in two steps, first through a general discussion on the findings, and then through a call for an ambidextrous perspective on inefficiencies.

5.1 RT Inc. as a semi-confusing information system

As seen in the Results section, RT Inc. displays several of the design characteristics of SCIS identified through the data. The results are summarized in Table 9.

Table 9. Summary of Inefficiencies and Examples of Repertoires

IE#	Inefficiency (variety)	Description	Example of repertoires of unsanctioned behavior
IE1	Information gaps (communication)	There are substantial gaps in terms of who has access to what information in the NPD process.	R&D conducts own customer studies instead of re-using material created by Market.
IE2	Asymmetric information flows (communication)	The flow of information is not aligned with the design of the NPD process.	Functions disregard market as a source of information, and de-prioritizing feed-back.
IE3	Conceptual fluidity (perception)	Core constructs for the NPD process are not uniformly defined throughout the organization.	Customer value is increasingly discarded as a construct further in the process, opening up for a sterner focus on attributes.
IE4	Value ambivalence (perception)	Core constructs are assigned different emphasis throughout the organization and NPD process.	Customer value is emphasized differently depending on hierarchical layer.
IE5	Distorted responsibility (evaluation)	Formalized responsibility is disregarded and responsibility is pushed forward in the NPD process.	Balancing of cost-functionality is done late in the process, by R&D
IE6	Lack of accountability (evaluation)	Formalized accountability is disregarded.	Work is conducted iteratively and in parallel instead of sequentially, disregarding the gate-system.

In terms of variety in communication, the findings show that significant information gaps are created by the lack of formal support (Management Control System, Knowledge Management system, NPD system, etc.),

¹ Explanations to Figure 7: GREEN = proportion of gates passed for any single week number. RED = proportion of gates not passed for any single week number. The white line represents the proportion of the green gates who are re-gates, i.e. which are assessed a second time (or more). Week 30 and 32 is missing due to this being the national vacation period.

and for the organization this is deemed a direct inefficiency. From the alternative perspective, the information gaps result in the necessity for localized knowledge and organizational capabilities associated with sensing (Eriksson, 2014; Helfat & Raubitschek, 2018; Teece, 2010; Teece, et al., 2016). In such a situation, the organization responds to information gaps by equipping itself with more dynamic capabilities over time, increasing its ability to act in absence of formal information. Said capabilities are instrumental for managing radical flux in the market with rapidly changing customer demands (Cheng & Kesner, 1997). A similar approach can be found in the design characteristic of asymmetric information flows. Here, the dominance of the feedback rather than the feedforward of information is a sign of interactive control (Müller-Stewens et al., 2019; Simons, 1994), in which the lack of information from previous stages in the process results in a continuous dialogue. In this dialogue, situational awareness is heightened as work transgresses the traditional silos.

In terms of variety in perception, design characteristics in relation to conceptual fluidity seen through the lack of a uniform definition of customer value simultaneously creates possibilities for interpretative viability (Benders & Van Veen, 2001) in the process. With functional specialization in the workforce and tasks assigned throughout the process, the imposition of a uniform definition, syntax, and taxonomy of customer value would do little to avoid the necessary inter-functional translation. The role of domain-specific knowledge (Xiao, Zhang, & Basadur, 2016; Eriksson, 2014) in each function is critical and invariably associated with its own particular language. Value ambivalence functions in the same manner, with the dominant perspective being attributes rather than value as a core construct. This signals that the language of NPD is not, as in line with strategy, that of customer value but rather product attributes. Through accepting the internal use of domain-specific language, the organization would create opportunities for accepting the different perspectives rather than attempting to “over-rule” them with the corporate language of customer value.

In terms of variety in evaluation, the biased responsibilities as found in the analysis of value to cost balancing is of particular interest. Through pushing responsibility for balancing cost and value to R&D and Manufacturing, the organization creates the potential for more creativity in the earlier stages of the process. In other words, cost replaces value as a core construct the further down the path to a new product the organization goes. Albeit a sign of inefficiency, the increased leeway that this offers the marketing, strategy, and design functions could be seen as a safeguard against reality butting in on the ideation and conceptualization of a new product (see Berente et al., 2016 and Yeow, et al., 2018). This is also reflected in the findings in relation to the lack of accountability for failures in the process. Missing the mark as a function does not result in any immediate repercussion, nor does it lead to a cessation of the overarching NPD process. Instead, unresolved issues in earlier stages of the process are continuously addressed as the project progresses. This creates the environment for a continuous re-examination of chinks and potential faults in the product as it emerges, without the risk of losing face for the functions that have failed to deliver on time. The lack of accountability, in other words, allows for increased flexibility over time (Berente et al., 2016; Abdulkadiroglu et al., 2011).

5.2 How SCIS informs the study of ambidexterity

Our results identified multiple inefficiencies in the setup of the NPD process (Table 9). However, the perspective of SCIS affords us to see said inefficiencies as features, not bugs of the semi-confusing system itself. The inefficiencies act as drivers of unsanctioned behavior (to circumvent shortcomings in the formal governance), which in turn act as drivers of variety and hence SCIS compliance (i.e. level of correspondence with the design characteristics of semi-confusing information systems). This results in a decentralization of the enactment of ambidexterity and in potentially re-allocating resources from exploitation to exploration (based on the theoretical assumption of exploration and exploitation are the sole parts of the whole [March, 1991]). As an example, in IE5, researchers observed that the respondent from R&D highlights that instead of slimming down the content in order to meet the gate on budget, the properties are allowed to take precedence over the costs. Employees hence circumvent the formal control (gate system) designed for exploitation in order to re-allocate cost to finding the right new solutions, i.e. exploration. Combined, on the basis of previous findings (Luger, Raisch & Schimmer, 2019; Zimmermann, Raisch & Cardinal, 2019), decentralization of enactment and decreased allocation to exploitation impact the organizations ambidexterity, both in balance and in enactment. This overview of the relationship between inefficiencies and ambidexterity identified in this study is presented in Figure 7.

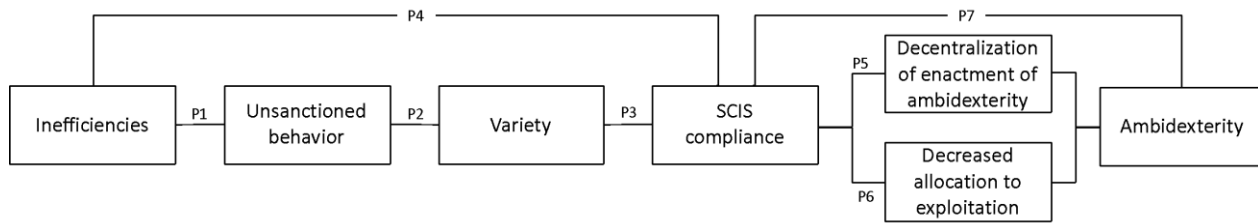


Figure 7. Overview of Relationship Between Inefficiencies and Ambidexterity

The findings result in four initial propositions for future research based on the analysis of our case study.

P1: There is a positive relationship between inefficiencies and new repertoires of unsanctioned behavior in the organization.

The first proposition stems from the identification of variation in behavior attributable to the inefficiencies. The inefficiencies are identified as slack (Mousa, Chowdhury, & Gallagher, 2017; Stock et al., 2019), which has been shown to positively influence unsanctioned behavior in the past and drive innovation (Lungenau, Stern & Zajac, 2016). As seen in Magnusson, Koutsikouri & Päiväranta (2020), a substantial amount of the total innovation happens in the shadows of control, i.e. is enacted in the form of shadow innovation.

P2: There is a positive relationship between new repertoires of unsanctioned behavior and increased variety.

The second proposition is manifested in how the unsanctioned behavior drives variety in operations associated with NPD. Here, we find that sanctioned behavior streamlines operations, whereas the unsanctioned behavior drives diversity and variety in both approaches, solutions and work-arounds (Berente et al., 2016).

P3: There is a positive relationship between increased variety and increased SCIS compliance.

The third proposition is one of correspondence between the variety identified and the SCIS characteristics described by Hedberg & Jönsson (1978). The identified variety is associated with what we refer to as SCIS compliance, i.e. compliance with the design characteristics of SCISs.

P4: There is a positive relationship between an organizations level of SCIS compliance and the level of inefficiency.

The fourth proposition attributes a direct relationship between the level of inefficiency and SCIS compliance. Here, we propose that the higher the level of inefficiency in a process, the higher the level of SCIS, turning SCIS compliance into a measure that for different organizations will have different optima.

These first four empirically grounded propositions raise two key issues for the study of ambidexterity. First, is the issue of balancing between exploitation and exploration, as noted by Zimmermann, Raisch & Cardinal (2018) and Luger, Raisch & Schimmer (2018). Zimmermann, Raisch & Cardinal (2018) state that there is a distinction between ambidexterity through design and configuration, and previous studies have mainly focused on the design perspective. As they argue, their empirical work points toward ambidexterity not being an issue for senior managers to design, but rather for front-line managers to enact (i.e. configure). Balancing thus by necessity becomes a muddling-through by employees in the front-line. Our empirical work in RT Inc. provide support for this finding. Ambidexterity is enacted through a constant balancing conducted by the employees and different teams along the NPD, where less than optimal formal control systems may be circumvented and resources allocated by constant micro-level mis-alignments rather than with strategic intent (i.e. aligned). As noted by Berente et al. (2016) as well as Yeow, Soh & Hansen (2018), this calls for certain degrees of freedom in control, which are deemed as design criteria for SCIS. Accordingly, the level of compliance with SCIS design criteria becomes a measure of how de-centralized balancing is, i.e. how configurational (Zimmermann, Raisch & Cardinal, 2018) it is. Hence, the fifth empirically grounded proposition is:

P5: There is a positive relationship between an organization's level of SCIS compliance and their de-centralization of the enactment of ambidexterity.

This decentralization of ambidextrous balancing is also central to recent findings on the management of digital innovation (Nambisan et al., 2017), where the decentralization of general mandate is seen as core. As seen in Svahn, Mathiassen, and Lindgren (2017), who also focus on the automotive industry, this

decentralization is a necessary step towards tackling the challenges associated with an increased need for digital innovation in automotive organizations.

Second, is the issue of the boundaries between exploitation and exploration, also highlighted by Stokes et al. (2015). If the core concern of ambidexterity is to avoid the reported trade-offs between exploitation and exploration, then we need definitions that are discriminant and that allow us to approach the phenomenon empirically. This study shows that the NPD process of RT Inc. is equipped with inefficiencies, and that these inefficiencies are associated with repertoires that re-allocate resources towards increased variety, i.e. decreased efficiency. Hence, the boundaries are semi-permeable and fluid, provided SCIS design criteria are followed, and we can derive a sixth empirically grounded proposition:

P6: There is a positive relationship between an organization's level of SCIS compliance and their decreased allocation to efficiency.

Finally, the level of compliance with SCIS design criteria becomes a measure of how fluid the boundaries between exploitation and exploration are, i.e. how dynamic the balancing of ambidexterity is. This results in the seventh (theoretically grounded) proposition for future research:

P7: There is a positive relationship between an organization's level of SCIS compliance and their dynamic balancing of ambidexterity.

As noted by Luger, Raisch & Schimmer (2018), an organization acting in an environment with shifting levels of dynamism needs to be able to both balance and re/un-balance in order to stay ambidextrous. A certain level of balance between exploitation and exploration invariably leads to inertia, calling for capabilities for breaking the existing balance. The identified inefficiencies act to ensure that sufficient resources are allocated toward exploration rather than exploitation over time. With inefficiency built into the design of the NPD process, there is time for reflection and re-interpretation and, perhaps foremost, micro-mistakes and continuous reconfiguration (Zimmermann, Raisch & Cardinal, 2018). Variety in communication, perception, and evaluation increases the pluralism of ideas coming into play, slowing the process and making it more likely to result in minor glitches. At the same time as it increases the risk on the micro-level, it also decreases the risk at the macro-level (Luger, Raisch & Schimmer, 2018). With a constant re-orientation on the basis of variety, the risk of creating a product that is not in line with consumer demand and expectations is expected to decrease.

5.3 Future research

We see two main avenues for future research stemming from this study. First, the identification of inefficiencies as central tenets in the enactment of ambidexterity introduces a potential new approach for ambidexterity research. Following the configurational approach as advocated by Zimmerman et al. (2018) and the dynamic ambidexterity approach of Luger, Raisch & Schimmer (2018), we see the enactment as described in this study as inspiration for future studies of "how" rather than "what" (Wiener et al., 2016). There is a tendency within ambidexterity research to strive for normative findings in relation to configurations for ambidexterity (Birkinshaw et al., 2016; Raisch & Birkinshaw, 2008; Heracleous, Yniguez & Gonzalez, 2018), rather than looking more intently at how organizations actually balance exploitation and exploration over time. We hope that the proposed notion of inefficiencies as tenants in the enactment of ambidexterity may offer a novel approach for future studies, where P5-P7 may be used as a basis for research design.

Second, we see a more nuanced understanding of inefficiencies as a stepping-stone for a wide range of new research questions. When is, for instance, an inefficiency merely an inefficiency and not a mechanism for the enactment of ambidexterity? How can we differentiate between different types of inefficiencies, moving towards a typological theory of inefficiencies? We hope that these and similar questions may inspire future research.

5.4 Implications for practice

There are three main implications for practice. First, organizations intent on conducting major transformation initiatives such as the one depicted in RT Inc. should use the findings presented here with a note of caution. For organizations similar to RT Inc., dominated by an engineering culture (Kunda, 2009), there are a multitude of "best practices" that would solve the inefficiencies identified. The organization could find itself in the process of eliminating all the inefficiencies for the sake of creating an optimized NPD process. According to our experience at RT Inc., this would most likely be a mistake. The informal controls present in the absence of formal controls often function as safeguards for innovation, encouraging dialogue, shifting

responsibility and accountability, etc. The engineering approach to increase efficiency could in this instance risk overriding elements of control that are instrumental for the organization's innovation capabilities. From this perspective, increasing the efficiency of the NPD process could risk decreasing the ambidextrous capabilities of the organization, resulting in a tradeoff between innovation and efficiency (Luger, Raisch & Schimmer, 2018; Zimmermann, Raisch & Cardinal, 2018).

Second, our study highlights the role of individuals rather than formal controls for executing strategy in RT Inc. In lieu of the strategy-as-practice movement (Whittington, 1996), the failures of formal control at RT Inc. lead to the emancipation of the employees in the execution of strategy. In this respect, the enactment of ambidexterity is done by individuals and not the organization as such, which re-frames ambidexterity from an organizational to an individual task. Managers working in similar environments should consider how this enactment is supported through varying degrees of freedom. In line with Zimmerman et al. (2018), this places additional emphasis on the front line employees rather than on the senior management in the enactment of ambidexterity.

Third, for organizations striving to enhance their innovation capabilities, this study hints at a structured manner in which this work could be conducted. With the support of Hedberg and Jönsson's (1978) three types of variety are better able to serve as design characteristics for organizations and management control to handle increased uncertainty, both inside and outside the organization (Ghoshal & Moran, 1996). In order for the organization to dynamically balance exploration and exploitation, said design characteristics should be considered as potentially valuable and not something that should invariably be avoided.

5.5 Limitations

The study has two main limitations. First, secondary analysis of qualitative data as used in this study is always associated with caveats. As noted by Heaton (2008), secondary analysis suffers from problems associated with data fit, not having been there and verification (i.e. statistical generalizability). Amongst these, we single out the data fit as the more significant problem, since the researchers were involved in the original data collection and statistical generalizability was not a purpose of the explorative study. In terms of the data fit problem, we believe that the design choice of targeting inefficiencies in the original study and utilizing these as the basis for a secondary analysis warrants a sufficient data fit. Second, the use of a single-case approach also prevents researchers from generalizing their findings. This is a well-known and researched phenomenon, and we argue in line with Eisenhardt & Graebner (2007) as well as Flyvbjerg (2006) that this is a misunderstanding where theoretical generalizability has been equated with statistical generalizability. In our study, we have not relied on statistical generalizability to verify our findings.

Second, with type of organization selected for the case study in the automotive industry, this is also associated with limitations related to transferability and generalization. As noted earlier, the automotive industry is undergoing several disruptions in the area of digital transformation, electric vehicles, etc. (Svahn, Mathiassen & Lindgren., 2017, Bohnsack et al., 2014). Our study took place at a time where these changes were very much an issue, with significant implications (Vial, 2019) for the future practice and evolving business models. We have not specifically studied the impact of these changes on the NPD, but rather studied the NPD in its current form. While RT Inc. was at the beginning of its journey of embracing industry changes at the time of the study, we have not studied the industry dynamics as a separate variable.

6 Conclusions

Through applying the framework proposed by Hedberg and Jönsson (1978) coupled with recent findings from the field of organizational ambidexterity (Luger, Raisch & Schimmer, 2018; Zimmermann, Raisch & Cardinal, 2018), this paper has explored the role of inefficiencies in the enactment of ambidexterity. The findings show that instead of solely being a detriment to the organization's performance over time, inefficiencies function as destabilizers, positively influencing the dynamic balancing between exploitation and exploration and decentralizing this balancing to the front-line of the organization. Inefficiencies should hence be studied not as bugs in the organizational system but rather as potential features that could facilitate the enactment of ambidexterity. Our study presents a set of propositions for future research that we hope will be of value to researchers interested in further studies of ambidexterity.

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