

Cognition in Human Resource Allocation for Digital Product Creation

Fabian Hoeft

School of Business and Society, University of York, UK
Fabian.hoeft@york.ac.uk

Abstract

This paper aims to understand the involvement of cognitive versatility in scenarios of tension between decision-makers. The paper uses a qualitative case study of human resource allocation for digital product creation at a UK-based car manufacturer. Data retrieved through meeting observations, qualitative interviews, workshops, and internal documents were analyzed and triangulated. Three main findings were made. First, managers suggested in interviews and communication with the organization that Human Resource (HR) allocation decisions are rational, based on aligned metrics across digital product opportunities. While managers compare opportunities against each other, for example, annualized monetary savings, a tendency towards familiar types of work with familiar metrics was evident. For example, supply chain cost savings were justified more easily than customer experience improvements. Second, the HR allocation process favors digital product opportunities presented by managers who have stronger relationships with the executives and are better at convincing the wider management team, for example, through powerful storytelling, thereby bypassing objectified comparisons of opportunities. Third, managers over-rationalize and simplify the complexity of reality. For example, the HR allocation process assumes that all employees in the same role perform equally well within different team and product environments. As a result, previous knowledge, experience, and relationships have been widely ignored, leading to HR reallocation transaction costs. The lessons gleaned from the case study suggest that (1) managers and their HR allocation decision-making are not as rational as they think and say they are, (2) surfacing some of the hidden, intuitive decision influences might improve decision outcomes, and (3) ensuring to fully account for the strategic value of unfamiliar digital products might help managers to understand the real value of opportunities.

Keywords: *Human resource allocation, Digital product, Business problem, Decision making*

1. Introduction

Organizations have long recognized Human Resources (HR) as vital to solving novel and complex business problems [1][2][3]. To meet customers' changing and increasing needs, businesses offer and use increasingly digital products, such as digital customer interfaces and internal digital monitoring tools [4][5]. Organizations recognize the need to develop digital products effectively (i.e., building the right products) and efficiently (i.e., building the

Article history:

Received (August 29, 2023), Review Result (September 30, 2023), Accepted (November 9, 2023)

products right). This requires organizations to continuously reallocate HR (e.g., product managers, data engineers, data scientists, and data analysts) to digital product opportunities [6][7]. Organizations capable of continuously doing this effectively and efficiently have a competitive advantage over their rivals.

Despite the strategic importance of developing digital products effectively and efficiently, allocating HR for digital product creation is challenging for organizations. For one, there is tension between managers involved in the HR allocation process, for example, between more or less technical stakeholders, such as product managers and technical leaders. Moreover, intuition and rational processes are involved in the decision-making that may lead to non-favorable business outcomes. Hence, it is not trivial for organizations to make effective and efficient digital product creation HR allocation decisions.

Scholarly attention has delved into the involvement of intuitive and rational processes in business decisions. Prior research has shown that some business contexts allow combining these two – referred to as cognitive versatility [8] – more easily than others. For example, negotiations between rational, data-driven engineers and intuitive, subjective designers in the design evaluation highlighted alignment challenges [9][10]. However, research has yet to shed light on how intuition and rationality are combined in scenarios of tension between decision-makers. For this reason, the paper uses a qualitative case study of human resource allocation for digital product creation at a UK-based car manufacturer.

The remainder of the paper is structured as follows. The next section presents the literature around two key themes: (1) intuitive and rational decision-making and (2) digital product HR allocation. The data collection and analysis are detailed in Section 3. Section 4 presents and explains the case study. Subsequently, the three major findings from the research are discussed in Section 5. Conclusions for scholars and managers finalize the paper.

2. Literature review

2.1. Intuitive and rational decision-making

“Nothing in life is as important as you think it is while you are thinking about it.” – [11]

Many business leaders, including Elon Musk and Richard Branson, publicly emphasized the importance of intuition in making some of their most fundamental business decisions [12][13]. Management scholars argue that strategic decision-making – business decisions by managers to achieve and sustain competitive advantage [14] – relies on intuitive and rational cognition [8][15]. Intuitive cognition is fast, automatic, and non-conscious, e.g., jumping away from a car that would hit us [15]. Intuition is not the same as heuristics, which are also fast and lower effort, but a rule of thumb to inform conscious judgment [16]. Rational cognition is slow, controlled, deliberate, and conscious, e.g., when systematically analyzing process inefficiencies [17].

In some business and management areas, like entrepreneurship and business venturing decisions [18] and management education programs [19], intuition has been widely ignored until fairly recently.

Intuitive and rational processing involvement in strategic decision-making is associated with methodological challenges, e.g., due to the partly sub-conscious nature, self-reporting is challenging [18].

Many scholars suggest that rational decision-making is the right approach and is more likely to produce positive outcomes [20], while others find that “instantaneous decisions are sometimes better than those based on lengthy, rational analysis” [21].

The two process types are independent but interactive, i.e., they can occur in combination for strategic decision-making. Easen and Wilcockson [15] argue that intuition may be understood as an irrational process that has a rational basis. Intuitive thinking has certain essential features and involves the use of a sound, rational, relevant knowledge base in situations that, through experience, are so familiar that the person has learned how to recognize and act on appropriate patterns.

How managers combine the two cognitions for strategic decision-making – as arguably all decisions involve both processes – has been partly explored. Baldacchino et al., [8] argue that influential decision-makers are characterized by cognitive versatility, the use of both intuition and analysis on a high level, to reach strategic decisions. Hodgkinson et al., [22] find that rational reasoning drives strategic planning and organizational spontaneity, while intuitive reasoning only drives strategic planning.

Combining intuition and rationality seems to be especially challenging in contexts where business areas that are somewhat different in their ways of working have to collaborate, e.g., when more rational data-driven engineers negotiate with more intuitive, subjective designers in the design evaluation [9][10]. Research has yet to shed light on how intuition and rationality are combined in scenarios of tension between decision-makers.

2.2. HR allocation decision-making

One such area of tension between decision-makers is Human Resource (HR) allocation. HR allocation involves matching business needs (e.g., initiatives) to internal (i.e., employees) or external (e.g., suppliers) HR pools. Surprisingly, there is not a large body of literature specifically about the allocation of financial, physical, technological, and human resources that support firm strategies [23].

Some avenues of intuition and rational analysis in the HR allocation process have been unexplored previously. Ketkar and Workiewicz [24] investigated employee self-selection in initiating and joining projects. They found that self-selection performs better when human capital (number of people) is relatively low compared to the number of opportunities (projects). Natarajan et al., [25] researched rewards for and control of middle management in shaping resource allocation and “argue that higher income growth uncertainty (rewards) and lower monitoring (controls) increase resource allocation most strongly when middle managers are more involved in decisions”.

Other studies suggest that rational resource allocation should be the desired approach to resource allocation. For example, Wu et al., [20] conclude in the context of photovoltaic project risk analysis in a positive tone that their work may contribute to rational resource allocation and effective risk prevention, implying that the former is generally desirable.

Eliens et al., [17] investigated the involvement of intuition and rational analysis in resource commitments in New Product Development (NPD), distinguishing between gatekeepers who think rationally and those who follow their intuition. They argue that the “unwillingness of a gatekeeper to let go of a fruitless NPD project wastes valuable resources and hampers NPD performance”.

Other studies found that managers' thinking is not as binary (i.e., managers have their own thinking style) but that managers' tendency towards the involvement of intuitive and rational reasoning depends on various factors, including the type of decision [8][15]. Especially established firms seem to struggle with making the right technological choices that involve unexplored and uncertain terrain; the same (established) firms failed to develop simpler

technologies that initially were only useful in emerging markets because impetus coalesces behind, and resources are allocated to, programs targeting powerful customers [26].

Hsee et al., [27] investigated bounded rationality in resource allocation decision-making. They found that people tend to choose smaller over larger resource pools when knowing that resources in each pool will be divided equally amongst the choosers.

2.3. Digital product HR allocation decision-making

The HR allocation process is critical in areas demanding creativity, high cognition, and complex problem-solving due to increased HR requirements. Digital product creation is one such area. Digital product creation is a business unit and capability group consisting of varying capabilities, like analytics, data science, data engineering, and digital product management, to identify and quantify problems, develop solutions, and launch firm internal (e.g., issue reporting tool) and external (e.g., online configurator tool) products [28]. As more and some might argue, every business is becoming a digital business, and digital is increasing in strategic importance to remain competitive [7][29], and many traditionally physical products are being digitized [6], digital product creation is growing in importance. As human resources are vital to creating digital products successfully, there is a need to understand how firms decide which digital products to develop and how to allocate people to those products. In digital product creation, various stakeholders must agree on allocating HR to product opportunities. In this context, higher tension levels are present, for example, due to different, more or less technical (e.g., product managers and technical leaders) stakeholders involved.

Despite the potential benefits of using cognitive versatility, business units creating digital products face challenges in allocating HR to digital product opportunities. First, managers align digital product HR allocation decisions with business units and company objectives. Comparing potential products is challenging as value levers cannot always be compared straightforwardly, e.g., comparing process time savings, employee time savings, and improved decision quality. Second, the existing HR pool most likely does not perfectly match the HR requirements for potential products to be created. Thus, decisions involve compromises and considering both existing resources and resource requirements. Third, digital product managers need to align with other internal senior leaders on HR allocation decisions. This alignment process is challenging as various levels of intuition and rationality are involved in the decision process. Hence, effective and efficient allocation of HR in creating digital products is a complex process.

Yet, a limited number of studies focus on HR in digital product creation. While there are some risks that rigid digital product creation processes, including HR allocation, limit fluidity, creativity, or change, those risks can be mitigated by introducing the right level of process formalisation [5]. Narayanan et al., [30] found a positive effect of managing task uncertainty in technology-intensive project environments by introducing task closure policies in the operative delivery of digital products. E Silva and Costa [31] emphasized that allocating people to technology projects is a challenging and complex task that increases in difficulty and complexity proportional to the number of projects, people, and capability requirements involved. While those studies provide some insights into and explanations for HR-related issues in digital product creation, the critical issue of HR allocations to digital products requires further investigation.

2.4. Research gap, question, and objective

Specifically, managers need to understand how to use intuition and rational analysis in digital product creation to allocate HR to products. The HR allocation occurs once company and business unit strategy-making has taken place [32][33]. The HR allocation process is an iterative process between people within capabilities (e.g., product management, data engineering, data science, or data analytics) available and capability needs, considering decision factors such as product value, feasibility, and strategic relevance [31][32]. It is important to understand this issue as previous studies on cognitive versatility highlighted the relevance of a nuanced understanding of decisions for improving outcomes. Successful digital product creation depends on the right HR allocation, so it is imperative in this context. This nuanced understanding might be especially needed today in an area like digital product creation of major and growing strategic importance.

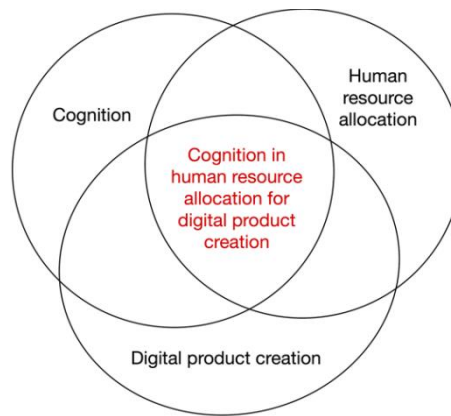


Figure 1. Research gap

To close this research gap, the research question this paper attempts to answer is “How does cognitive versatility affect human resource allocation for digital product creation?”. Thereby, the work aims to understand the varying degrees of intuition and rational analysis in combination involved across managers in making HR allocation decisions. It is important to understand the nuances of cognition involved as previous studies showed evidence for varying context-dependant cognition involved [8][22]. Further insights might help us uncover and explain underlying thought and management alignment processes.

3. Methodology

This paper uses a qualitative case study of human resource allocation for digital product creation at a UK-based car manufacturer. Qualitative case studies allow for obtaining rich, naturalistic data and are widely used to explore issues needing strong theory. It is deemed most suitable for the task at hand as cognition in HR allocation for digital product creation remains unexplored, and it is required to paint an initial picture of the involvement of cognitive versatility in the decision process.

The car manufacturer case study was chosen for three main reasons. First, the company recently established a dedicated digital product creation team recognized by technical leaders and through awards for its strong performance, thereby offering the potential to understand

how they allocate HR to digital product opportunities efficiently and effectively. Second, the firm is an established incumbent that allows the observation of a more complex organizational system, promising rich insights into the decision processes. Third, the automotive industry environment is highly dynamic, requiring firms to adapt their digital products continuously and offering the potential to observe nuances in the required decision processes.

An iterative process following three main phases for data collection and analysis was used, lasting from November 2021 to December 2022. First, internal company documents on the HR allocation for digital product creation have been reviewed to gain an initial understanding of the firm's processes and organization. Second, three quarterly resource allocation meetings and one retrospective workshop of the managers and executives have been observed and documented to understand how the organization operates.

Third and informed by the documents reviewed and meetings observed, 23 qualitative in-depth interviews with digital product managers at the firm have been conducted. As digital product managers coordinate cross-capability teams, are the face of the digital products towards stakeholders, and are making the HR allocation decisions with senior business leaders, they are best suited in terms of knowledge, relationships, and involvement to discuss questions for this study. The consideration of domain-specific experience in the purposive sampling process is in line with earlier studies arguing that domain-specific experience is a prerequisite for intuition, i.e., intuition can only be used effectively by experienced managers [22]. Baldacchino et al., [8] found that experience is associated with an improved ability to use intuition and analysis.

The interviews followed key themes stemming from the firm's documents and meetings. Particular attention has been paid to the reasoning in the decision-making and the tension between stakeholders. Triangulating documents and observations with the interviews were important as (1) subconscious processes are difficult to unpack through interviews but are rather observable, and (2) people tend to rationalize the nature of their own decisions in interviews. The number of interviews resulted from data saturation, i.e., additional interviews did not lead to further insights [34]. Data has been analyzed using thematic analysis [35][36].

4. Digital product creation case study

4.1. Organisational background

The car manufacturer is an internationally operating organization that traditionally focuses on the manufacturing and selling of vehicles. Over recent years, the company concentrated increasingly on digital products. Digital products are internal (e.g., monitoring dashboards or data-driven root cause analysis tools) or external (e.g., vehicle configurator or vehicle control app). The firm's digital product creation team was established in 2018 and grew to approximately one hundred seventy full-time equivalent employees in December 2021. With the business unit growth, the managers and executives had to introduce structures and processes to ensure effective and efficient working.

A change for the executives introduced in late 2021 is the shift from yearly planning and ad-hoc adjustment to a Quarterly Business Review (QBR), in which leaders (de)prioritize work and reallocate resources based on changing environments and aligned with strategic priorities. As part of the QBR, managers, and executives discuss the current digital product portfolio, plan looking forward, and allocate HR to digital product opportunities. The

following section is based on the organization's internal documents and QBR meeting observations.

4.2. Document review and observations

Document Review

The portfolio at the car manufacturer is structured into domains and themes. Themes are buckets of work that are thematically close and usually led by between one and two product managers who coordinate a theme team, including, for example, data engineers, analytics consultants, and data scientists. A theme can include multiple products and address one or more problem statements. Typically, a theme involves the same or similar business stakeholders, such as subject matter experts, external partners, and key decision-makers. Domains summarise themes into business areas for management and reporting purposes. Typically, a senior Digital Product Manager (DPM) is responsible for a domain, sets the strategic direction, attempts to create synergies within the theme, and provides senior issue escalation support.

With the introduction of themes, the business aimed to (1) focus on the most significant issues at the time, (2) concentrate efforts and resources, (3) provide team autonomy and stability, (4) maintain strong relationships across functions, and (5) build domain expertise.

The business unit's portfolio management follows a portfolio-wide standardized approach. Overall, the leading portfolio management objective is to align activities with strategic priorities, create transparency, and entail low administrative overhead. While QBR and resourcing take place quarterly, a monthly portfolio review updates on the key developments in delivered and planned value, products, team, success stories, risks and blockers, digital connections, and step-away strategy per each theme. Every week, the DPMs meet within their domains to discuss updates on their themes and associated products, including dependencies and challenges. Given that all products are digital or have a significant digital component, teams on the product level work in two-week sprints with scrum boards and follow established agile cadences, including sprint planning, sprint reviews, sprint retrospectives, and daily stand-ups.

The car manufacturer aims to increase value delivery and reduce administrative overhead through a structured and transparent approach. The outcome of the QBR is a list of priorities, themes, allocated resources, and value estimates. Themes that were not prioritized were either deprioritized for the unforeseen future or invited to be considered at the next QBR if specific investigations were completed and conditions met. Regarding resourcing, all employees within the digital transformation unit, except for senior managers and directors working on the domain and portfolio level, were allocated to themes as part of the QBR alignment.

Meeting observations

Following the document review, the researcher observed the QBR and resource allocation meeting. The purpose of the meeting was to review the digital product portfolio, prioritize themes, and agree on HR allocations for the following quarter. No interaction between the researcher and the attendees happened during the meeting, and the recordings were made by a silent observer.

Throughout the meeting, it was evident that the business unit was committed, and the senior leaders to incentivized to deliver monetarily quantified business benefits. As a result, the different digital product opportunities were, amongst others, compared in terms of monetary value added. While this process may sound objective and rational, it was apparent that it favors digital products that the organization is already working on and that are familiar

to the managers and executives. As the prioritization process requires managers to create compelling business cases that are agreed upon with the finance department, familiar areas where managers have more knowledge to create business cases have an advantage. It was also apparent that the finance department would only accept familiar and proven financial metrics, such as employee time savings, and not necessarily more unfamiliar metrics, such as monetary benefits of customer experience improvements. As digital products' financial benefits are a leading prioritisation factor that inputs into the HR allocation decisions, it seems to be a root cause for not ideal HR allocations.

When the digital product managers presented their digital products and HR allocation proposals, it was evident that the ability to present well, influence others, and interpersonal relationships played an important role. The better the proposals were presented, the more attentive and engaged the other managers and executives seemed. Thereby, the digital product managers shifted the focus away from objectified metrics to a more intuitive gut feeling about the proposal, which was also reflected in more favorable HR allocations. Similarly, some senior managers seemed to have digital products they were intuitively passionate about and convinced the rest of the management team that these products were worth developing by telling stories that were not always rooted in more favorable business cases than potential alternatives.

4.3. Interview findings

Digital product managers, other senior decision makers (e.g., technical leaders), and other executives interviewed for this study agree that it is important to develop a digital product portfolio that best aligns with the organization's strategic priorities. There also was consensus that this requires assessing and comparing available options like for like:

“Historically, we’ve focused on traditional, known automotive metrics, like job 1 delays and FTE time savings. Today, we need to focus more on the full set of metrics affecting customer experience and move towards a more balanced scorecard when making digital product decisions. Thereby, we must ensure that we sufficiently account for the monetary value of all potential products, especially the more unfamiliar and perhaps forward-looking.”

To effectively and efficiently run the QBR meeting, the interviewees emphasised that it is important to align with the relevant stakeholders before the meeting. Relevant stakeholders might include senior managers from the business and finance to help assess the viability of the business case. It also seems vital that the product managers presenting their proposals align the proposed solution approach with the relevant technical capability leads to ensure that it is technically sound.

Additionally, interviewees highlighted that pre-QBR alignment amongst the digital product managers is important to identify any potential dependencies or gaps. Dependencies could be functional or technological; for example, one product focuses on decision-making, and another on the automatic decision transaction. Another example could be that a product requires a certain data set to be maintained, and the alignment highlights that the data set is out of date and partly incorrect. One product manager stated,

“It is critically important that the problem statement we are addressing is clearly defined and the right one and that the technical approach makes sense. Conversations with product management and technical peers is a way to improve this.”

Finally, the managers mentioned that the HR allocation to digital product opportunities should not just focus on roles and formal skill profiles but also consider personal preferences and development needs, previous experiences, and relationships. One manager pointed out that

“To attract and retain top talent, we must ensure that our colleagues enjoy what they are working on and are challenged to the right level in a productive working environment “.

To implement this, team members align with product managers and are asked about personal preferences regarding the work area and type of problem. These preferences are being considered in the allocation process, and reasons for allocations are explained with the HR allocation decisions.

4.4. Quarterly business review retrospective workshop

After the first QBR, the DPM team used the problem-solution-action structure in a brainstorming workshop format to identify improvement measures from the first to the second QBR. The [table 1] below summarises the workshop outcomes.

Table 1. QBR retrospective workshop outcomes

Issue area	Problems	Solutions
Communication	QBR timeline unclear, e.g., date for reallocation of teams The decision-making process is not transparent	Clear owners of communications and hold them accountable Agreed timescales Transparent and documented communication process Considering the time it takes to move resources in the timing plan Transparency over decision-making
Metrics	Success metrics not fully aligned with strategic priorities Success comparison across themes challenging	Alignment of DPC metrics with other QBRs Considering sustainability in metrics Considering targets for the next financial year in metrics Applicants' awareness visibility metrics Consider product lifetime value in metrics How to measure and improve motivation and rewards system for DPMs and wider team Product usage metrics (downloads, purchases, ...) Product delivery metrics (velocity, story points, burn-down rate, ...) Education of stakeholders in terms of new metrics
Resourcing	Instability across themes / too many reallocations Instability of decisions	Squad that can be deployed flexibly across different themes Include graduates, suppliers/partners, and all teams in resourcing Make decisions transparently and communicate reasons for them Consider DPMs and technical leads' feedback in decision making
Adherence	Graduates: misaligned rotation timings and unclear development plans Partly low partner/supplier quality No management process for unrequired resource	Communicate QBR decisions about a month before resourcing changes happen Agree on the impact of the theme in a, e.g., “share fare” format Highlight dependencies across themes Improved alignment with business stakeholders on objectives and plan pre-QBR
Other	Multiple misaligned QBRs across the organization Uncertainty in terms of what is expected from DPMs (e.g., preparation)	

A specific improvement area success and decision metrics. The workshop participants emphasized that a product's lifetime value and usage metrics should be considered, reflecting more accurately the real value and success achieved. Besides, other new metrics, such as sustainability and team impact, would need to be considered to reflect the long-term orientation of products.

The team also raised the idea that it could be more efficient and effective to build fixed squads, i.e., teams covering a range of capabilities, and deploy those to products every quarter instead of forming new squads every quarter and allocating those to products. With this different approach, the team members would already know each other and how to work well together.

Overall, the workshop highlighted that most perceived improvement measures relate to lacking or unsatisfactory communication, transparency, and involvement. The outcomes emphasise that it needs to be clear to everyone – both individual contributors and managers – involved, what is expected from them at any given time, when decisions are being made, and when changes are being implemented. This can be improved through a transparent communication process that all stakeholders follow.

5. Discussion

Three main findings were made. First, managers believe and claim to colleagues that HR allocation decisions are rational, based on aligned metrics across digital product opportunities. While managers compare digital product options against each other, for example, considering annualized monetary savings, a tendency towards familiar types of work with familiar metrics was evident. For example, supply chain cost savings were justified more easily than customer experience improvements.

Second, the findings highlight that the current HR allocation process favors digital product opportunities presented by individuals who have stronger relationships with the executives and are better at convincing the wider management team. Effective managers used, for example, storytelling to bypass objectified comparisons of opportunities.

Third, managers over-rationalize and simplify the complexity of reality and their decision-making process. For example, the HR allocation process suggests that all employees in the same role (e.g., a business analyst or data engineer) perform equally well within different team and product environments. As a result, previous knowledge, experience, and relationships of individual contributors have been widely ignored, leading to higher HR reallocation transaction costs than potentially necessary.

6. Conclusion

New digital opportunities and shifted customer preferences led to an increased demand for organizations to create digital products efficiently and effectively, resulting in the need to understand and improve HR allocation decisions in this context. The role of intuition and rational analysis in this type of decision, characterized by tensions between decision-makers, remained previously unexplored but promised to provide novel and relevant insights to understand business decision-making better. Using the case of a UK-based car manufacturer, this study offers insights from a leading digital product creation business unit. Having established novel ways of making digital product (de)prioritization and resource (re)allocation decisions, the case study highlighted the organization's attempt to rationalize decision-making by standardizing metrics and decision processes. However, intuition and more informal ways of influencing others still play a vital role in making HR allocation for digital product creation

decisions today. The strength of this influence highlighted a gap between the observations and what managers acknowledged in the interviews, suggesting that they think they make decisions more rationally than they do.

The findings are subject to constraints. First, while the company case study provided rich and deep insights, the insight's transferability to other contexts requires further research. Second, the data collection period, in which the organization still focused considerable resources on managing the results of the COVID-19 pandemic, offered insights into how the organization dealt with the external volatility but might also imply that the findings need to be verified in times of different external change. Hence, the results should be interpreted in light of the two constraints.

For managers, this paper uses HR allocation for digital product creation as a case to understand rational and cognitive decision processes more profoundly and derive measures to improve decision effectiveness and efficiency. The lessons gleaned from the case study suggest that (1) managers and their HR allocation decision-making are not as rational as they think and say they are, (2) surfacing some of the hidden, intuitive decision influences might improve decision outcomes, and (3) ensuring to fully account for the strategic value of unfamiliar digital products might help managers to understand the real value of opportunities. Surfacing some of the intuition-based, informal decision processes could help organizations make decisions less dependent on individual skills and relationships and more on aligning the digital product outcomes with the organisation's strategic objectives. The implications suggest that organizations should actively seek to create a rational-based and level playing field in the HR resource allocation process, especially when there is tension between decision-makers. Guiding questions could be developed and used collectively to create this transparency and awareness. Regular retrospective workshops can be used to receive feedback and improve the decision-making process continuously. The improvements should be implemented and communicated within the business unit to create transparency on how, why, and when HR resource allocation decisions are being made, which affect everyone in the organization and can contribute to a more positive workplace environment. Continuous efforts should be made to align HR allocations with the organization's strategic priorities and thereby improve digital product effectiveness and efficiency.

For scholars interested in business decision-making and cognition, this paper sparks ideas for further inquiries. While this paper used a single-firm case in which there is tension between decision-makers, future studies could compare the findings to evidence from a wider range of firms, for example, in different industries and of varying sizes. Moreover, closer attention could be paid to the specific manager characteristics, such as experience and background, the types of tensions between managers, and their link to cognitive versatility in business decision-making. This can contribute to a more nuanced and robust understanding of rational and intuitive processes in business decision-making. Additionally, other data sources, such as interviewees across the organizations, could be considered to obtain richer qualitative insights into the intuitive and rational decision nuances of pre- and post-decision-making. These recommendations for future research can build upon this paper's insights to further improve business decision-making when there is tension between decision-makers.

Appendix

A.1 Interview guide

- What does your HR allocation process for digital product creation look like?
- What kinds of tensions and between whom are present in the decision-making process?
- In what ways is the decision-making process rational and intuitive?
- Should the process be more rational or intuitive, and why?
- How could this be achieved?
- Anything else?

A.2 Meeting observation documentation template

Decision	Decision outcome	Stated reasoning	Observed reasoning	Rationality – intuition gap between stated and observed reasoning
[...]	[...]	[...]	[...]	[...]

References

- [1] M. Arias, R. Saavedra, M. R. Marques, J. Munoz-Gama, and M. Sepúlveda, “Human resource allocation in business process management and process mining: A systematic mapping study,” *Management Decision*, vol.56, no.2, pp.376–405 (2018)
- [2] C. Brewster, M. Brookes, and P. J. Gollan, “The institutional antecedents of the assignment of HRM responsibilities to line managers,” *Human Resource Management*, vol.54, no.4, pp.577–597 (2015)
- [3] L. Yang and C. Gan, “Cooperative goals and dynamic capability: the mediating role of strategic flexibility and the moderating role of human resource flexibility,” *Journal of Business and Industrial Marketing*, vol.36, no.5, pp.782–795 (2021)
- [4] S. Hilbolling, H. Berends, F. Deken, and P. Tuertscher, “Sustaining complement quality for digital product platforms: a case study of the Philips Hue ecosystem,” *Journal of Product Innovation Management*, vol.38, no.1, pp.21–48 (2021)
- [5] R. Pesch, H. Endres, and R. B. Bouncken, “Digital product innovation management: Balancing stability and fluidity through formalization,” *Journal of Product Innovation Management*, vol.38, no.6, pp.726–744 (2021)
- [6] G. Wang, “Digital reframing: The design thinking of redesigning traditional products into innovative digital products,” *Journal of Product Innovation Management*, vol.39, no.1, pp.95–118 (2022)
- [7] F. Wiesböck, T. Hess, and J. Spanjol, “The dual role of IT capabilities in the development of digital products and services,” *Information and Management*, vol.57, no.8 (2020)
- [8] L. Baldacchino, D. Ucbasaran, and L. Cabantous, “Linking experience to intuition and cognitive versatility in new venture ideation: a dual-process Perspective,” *Journal of Management Studies*, pp.1–42 (2022)
- [9] T. J. Hardman, “Understanding creative intuition,” *Journal of Creativity*, vol.31, pp.100006, Dec (2021)
- [10] C. Ranscombe, P. Kinsella, and J. Blijlevens, “Data-driven styling: augmenting intuition in the product design process using holistic styling analysis,” *Journal of Mechanical Design*, vol.139, no.11, Oct. (2017)
- [11] D. Kahneman, “Thinking, fast and slow,” New York: Farrar, Straus and Giroux, (2011)
- [12] R. Branson, “Instinct in a world of analytics.” [Online]. Available: <https://www.virgin.com/branson-family/richard-branson-blog/instinct-world-analytics>
- [13] E. Musk, “Elon Musk talks Twitter, Tesla and how his brain works — live at TED2022,” 2022. [Online]. Available: <https://www.youtube.com/watch?v=cdZZpaB2kDM>
- [14] D. J. Teece, G. Pisano, and A. Shuen, “Dynamic capabilities and strategic management,” *Strategic Management Journal*, vol.18, no.7, pp.509-533 (1997)
- [15] P. Easen and J. Wilcockson, “Intuition and rational decision-making in professional thinking: A false dichotomy?,” *Journal of Advanced Nursing*, vol.24, no.4, pp.667-673, Oct (1996)

- [16] R. A. Bettis, “Organizationally intractable decision problems and the intellectual virtues of heuristics,” *Journal of Management*, vol.43, no.8, pp.2620-2637 (2017)
- [17] R. Eliëns, K. Eling, S. Gelper, and F. Langerak, “Rational versus intuitive gatekeeping: Escalation of commitment in the front end of NPD,” *Journal of Product Innovation Management*, vol.35, no.6, pp.890-907, Nov (2018)
- [18] E. Sadler-Smith, “The role of intuition in entrepreneurship and business venturing decisions,” *European Journal of Work and Organizational Psychology*, vol.25, no.2, pp.212-225, Mar. (2016)
- [19] E. Sadler-Smith and L. A. Burke, “Fostering intuition in management education: Activities and resources,” *Journal of Management Education*, vol.33, no.2, pp.239-262 (2009)
- [20] Y. Wu, Y. Ke, J. Wang, L. Li, and X. Lin, “Risk assessment in photovoltaic poverty alleviation projects in China under intuitionistic fuzzy environment,” *Journal of Cleaner Production*, vol.219, pp.587-600 (2019)
- [21] L. Buchanan and A. O’Connell, “A brief history of decision making,” *Harvard Business Review*, vol.84, no. 1, pp.32-41 (2006)
- [22] I. R. Hodgkinson, P. Hughes, and H. Leite, “The cognitive micro-foundations, and socio-psychological mechanisms, of organizational decision-making in public management,” *British Journal of Management*, vol.00, pp.1–18 (2022)
- [23] C. A. Maritan and G. K. Lee, “Resource allocation and strategy,” *Journal of Management*, vol.43, no.8, pp.2411–2420 (2017)
- [24] H. Ketkar and M. Workiewicz, “Power to the people: The benefits and limits of employee self-selection in organizations,” *Strategic Management Journal*, vol.43, no.5, pp.935-963 (2022)
- [25] S. Natarajan, I. P. Mahmood, and W. Mitchell, “Middle management involvement in resource allocation: The evolution of automated teller machines and bank branches in India,” *Strategic Management Journal*, vol.40, no.7, pp.1070–1096 (2019)
- [26] C. M. Christensen and J. L. Bower, “Customer power, strategic investment, and the failure of leading firms,” *Strategic Management Journal*, vol.17, no.3, pp.197-218 (1996)
- [27] C. K. Hsee, Y. Zeng, X. Li, and A. Imas, “Bounded rationality in strategic decisions: undershooting in a resource pool-choice dilemma,” *Management Science*, vol.67, no.10, pp.6553-6567 (2021)
- [28] R. Haas and M. Sinha, “Concurrent engineering at Airbus - A case study,” *International Journal of Manufacturing Technology and Management*, vol.6, no.3-4, pp.241-253 (2004)
- [29] A. McAfee and E. Brynjolfsson, “Investing in the IT that makes a competitive difference,” *Harvard Business Review*, vol.86, no.7-8, pp. 98-107 (2008)
- [30] S. Narayanan, S. Balasubramanian, J. M. Swaminathan, and Y. Zhang, “Managing uncertain tasks in technology-intensive project environments: A multi-method study of task closure and capacity management decisions,” *Journal of Operations Management*, vol.66, no.3, pp.260-280 (2020)
- [31] L. C. e Silva and A. P. C. S. Costa, “Decision model for allocating human resources in information system projects,” *International Journal of Project Management*, vol.31, no.1, pp.100-108 (2013)
- [32] D. P. Lepak and S. A. Snell, “The human resource architecture: Toward a theory of human capital allocation and development,” *Academy of Management Review*, vol.24, no.1, pp.31-48 (1999)
- [33] N. M. Tichy, “Managing change strategically: The technical, political, and cultural keys,” *Organizational Dynamics*, vol.11, no.2, pp.59-80 (1982)
- [34] J. W. Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches*, 4th ed. London: SAGE Publications (2014)
- [35] V. Braun and V. Clarke, “Using thematic analysis in psychology,” *Qualitative Research in Psychology*, vol.3, no.2, pp.77-101 (2006)
- [36] M. Miles and A. Huberman, *An expanded sourcebook: qualitative data analysis*, 2nd ed. New York: SAGE Publications (1994)

This page is empty by intention.