

# Creating Competitive Advantage in IT-Intensive Organizations: A Design Thinking Perspective

Alma L. Culén<sup>1</sup> and Mark Kriger<sup>2</sup>

<sup>1</sup> Department of Informatics, University of Oslo, Oslo, Norway  
almira@ifi.uio.no

<sup>2</sup> Department of Strategy and Logistics, Norwegian Business School, Oslo, Norway  
mark.kriger@bi.no

**Abstract.** In this paper, we consider the role of design thinking and human computer interaction design (HCID) in shaping conditions for a long-term health of technology intensive organizations. Design thinking is gaining acceptance in management, strategy and leadership and is increasingly seen as a way towards finding solutions to complex problems of today's economy. We present our view on relationships between HCID and design thinking on one hand, and creative leadership, vision, values, knowledge and organizational culture on the other, as factors in shaping the competitive advantage for IT-intensive organizations. We find that, while HCID is systematically contributing to design of innovative technological solutions, it does so at a micro level, while design thinking holds a central position in our competitive advantage framework. Through a small case of innovation in the academic library, we provide insight in how design thinking and HCID facilitated changes in how the library sees its users, products, services and how it, subsequently, started changing its organizational vision, values, culture and knowledge.

**Keywords:** design thinking, strategy, HCI design, innovation, academic library, competitive advantage.

## 1 Introduction

The academic discourse around design thinking has started more than twenty years ago [35]. However, during the last few years the discourse has turned into a multidisciplinary discussion focusing first on design thinking in innovation [6], and then broadening to the field of economy, touching in particular management [30], strategy [19], and leadership [28].

Information technology (IT) is an essential element of the infrastructure of competitive economies and a key enabler of sustainable economic growth. However, IT no longer evokes images of computers or supercomputers, but of all the computational power they had at a fingertip of some mobile device. Computational ability and bandwidths are something few think of these days. Business value of technology is now more bound to capability of the leadership to invent new processes, procedures and organizational structures that utilize potential of these new technologies [7].

Researchers in economics investigated the relation between economic growth of a nation and how close the nation is to the technological frontier. In, for example, [1], the authors analyzed a range of issues related to technological progress and economic growth. They conclude that economies that are far from the technological frontier, favor investment-based growth strategies, while closer to the frontier, the value of innovation based strategies increases. On the other hand, Cairncross [10] claims that technology may accomplish one thing globally: it may reduce distances and enable truly global businesses, and ultimately, a true global economy. Technologies are, and will, continually evolve and improve, but they, according to Cairncross, were already at the beginning of this century good enough to enable speculations around their potential to influence whole economies and societies.

Design thinking and technological advancement are thus moving economies towards innovation-based strategies. There are various ways to define innovation. Oslo Manual [27] defines it as: *“the implementation of a new or significantly improved product (good, or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations.”*

In line with [6, 26, 28, 30], we consider design thinking as a paradigm changer in innovation.

In this paper, we discuss just how design thinking introduces the change and affects long-term innovation. It is known that, while easy to understand the need for innovation and the benefits it brings, innovation is hard to achieve in practice [31]. Does and how design thinking changes this? The paper presents the case of innovation at the university library, and the role of design thinking in that process. This process has, at its start, applied design thinking through design practice and development of new products and services by human-computer interaction design (HCID) students [12], then evolved to engage also employees [11], and finally, leadership, enabling organizational changes that foster long-term focus on innovation. The change was very much bottom-up, powered up by design thinking and designerly practices as understood by HCI designers, and not design thinkers from design disciplines. Our case differs from, for example, that of Procter & Gamble [25, 30] that became a flagship for arguing in favor of design thinking, where a visionary leader introduced and enforced design thinking in the company, with remarkable results. However, we hope that discussion of the case will help provide an empirical study which, together with other similar ones, would lead towards increasing academic understanding of how design thinking is used in practice and how it facilitates innovation, and creation of competitive advantage.

In line with [26], we believe that involving collaborative, multidisciplinary teams in innovation processes is a great way to create new opportunities for organizations. Collaboration in science, across disciplines, has its challenges, and results may not be repeatable [41]. Including design thinkers in collaborative efforts, might change this situation. Our experience from the library case indicates that it just might be so. The power of design thinking comes, in part, from its ability to synthesize different views, and activities in related processes are often experienced as positive and valuable.

In other words, it builds teams that are capable of overcoming differences, both individual and disciplinary.

The paper is structured as follows: in Section 2, we discuss design thinking and design thinkers and draw some parallels and differences from HCI and HCI designers. In Section 3, we set up the stage leading towards our framework for gain of competitive advantage for technologically intensive organizations based on creative leadership, vision, values, knowledge and development of exploration based organizational culture as factors. In Section 4, we present our framework, where both HCID and design thinking are factors. Section 5 presents the case of user driven innovation in the academic library and Section 6 short discussion and conclusion.

## 2 Design Thinking and HCI

In [6], Brown defined design thinking as *“a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.”* Thus, design thinking emerged as a multidisciplinary, human-centered approach to innovation. So what does it takes to become a design thinker?

Martin [30] explicates that everyone can work on becoming a design thinker. In order to become a design thinker one needs a stance, tools and experience that facilitate design thinking. The stance is related to one’s worldview and the role one has in it, tools are the mental models used to understand the world and organize thinking, while experience is needed for building of skills and sensitivities. This implies that one becomes a keen observer and finder of opportunities for design that could help reduce complexities of large, global problems such as poverty, health care, energy, education etc. [42].

Kolko, [21], provides an explicit relationship between design thinking and wicked problems:

*“A wicked problem is a social or cultural problem that is difficult or impossible to solve for as many as four reasons: incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems. Poverty is linked with education, nutrition with poverty, the economy with nutrition, and so on. ... These problems can be mitigated through the process of design, which is an intellectual approach that emphasizes empathy, abductive reasoning, and rapid prototyping.”*

Even this minimal selection of two definitions shows how the work of a design thinker may require different set of skills, yet both Martin and Kolko agree that these skills are suitable for tackling complex ‘real world problems’, such as the ones listed above. Faced with enormity of this task, we then asked ourselves the question: what is it that design thinking can actually do? A lot of scholarly work on design thinking in managerial realm was already reviewed and presented in [20]. The authors sort through what design thinking can be used for, instead of focusing on what it is:

*“As social constructionists we regard an approach that begins with the question, ‘What is design thinking?’ as an essentialist trap. We do not believe that there is a unique meaning of ‘design thinking’, and accordingly we should not look for one. Instead, we look for where and how the concept is used in different situations, both theoretical and practical, and what meaning is given to the concept”, [20, p. 12].*

The authors also include an important discussion on the role of design research and designerly practices with core concepts which include reflexive practice [36], meaning making and designerly ways of knowing [8].

The discourse involving the above concepts can also be seen as central for many HCID practitioners and researchers. HCI is no longer a field whose main concern is the interaction between a human and a computer, with a goal of making a better fit between the two [37]. The focus has broadened to include shaping diverse technologies for the use by people, focusing on a much broader aspects of interaction, including user experience design, design of services, environments, ecologies and systems. As a discipline, HCI is relevant for all IT-facilitated organizations, although they may differ in their use of HCI methods and tools. For example, how Apple Inc. and Microsoft design their operating systems is in a stark contrast: while Microsoft makes good use of users’ feedback and users’ experience, Apple is secretive about how their products are tested and improved [18].

There is a general trend in HCI to include more design-oriented practices and design thinking, see, for example, [16]. One of the authors of this paper, has explored introducing design thinking and designerly practices in project oriented teaching of HCI [13, 14], mainly in order to enable students to bridge the gap between ‘finding’ and ‘making’ [33], e.g., understanding intellectually and using making (prototyping) to explore possible solutions by visualizing them. Most people, depending on their sensory-motor makeup, environment and, in particular, education, develop preference for either finding or making. Engaging both makers and finders in collaborative innovation may indeed open some new possibilities.

Winograd and Klemmer, discussing now famous d.school at Stanford, an innovation hub with a core in innovation through design and HCID, say:

*“The basic premise of the d.school is that students need two complementary kinds of training. The disciplinary training provided by conventional departments provides them with depth in the concepts and experience of a specific field. This gives them intellectual tools, but often misses the larger context of relevance and integration with other kinds of knowledge, which are required to innovate effectively in the ‘real world’”, [7, p. 1].*

The school’s basic model of collaboration is centered in design thinking, but includes fields of business, technology and human values.

In our view, design thinking and HCID are complementary when it comes to the new product development. Many HCID practitioners are also moving into the area of service design, thus bringing HCI as a field closer to business and innovation. HCI designers still retain their finding paradigm as the dominant one, which makes them valued members of collaborative teams when designing technology, or discussing its feasibility. In addition, many of the tools used in HCID trade are very similar to those

of design thinkers, such as rapid prototyping. In addition, HCI designers have a very rich specter of user involvement tools and techniques in research and design. As we see it, the most important distinction between a design thinker and an HCI designer is how they view their work domain. While for a design thinker, the complexities of the ‘real world’ are the focus, the HCI designer have a lot more modest domain of developing innovative technological products and services.

### 3 Design Thinking and Competitive Advantage for IT-Intensive Organizations

The information-technology intensive organizations in industries that were previously quite separate are now rapidly converging on the same competitive spaces [22]. This is resulting in a ‘dance of the elephants’ – firms such as Amazon, Facebook, Google, eBay, Apple, Microsoft and Samsung that did not even exist 30 years ago or were a small start-ups and quite agile, have become large and increasingly hobbled in their agility by the sheer size and scope of their products and/or services [22]. As Porter notes, advanced technology or innovations are not by themselves enough to make these industries attractive or unattractive: *“Mundane, low technology industries with price-intensive buyers, ..., are often far more profitable than sexy industries, such as software and internet technologies, that attract competitors”*, [34, p. 22].

These IT-intensive organizations have in the past used traditional ways to expand, by either exploiting known technology on new markets, or by developing new technology for established markets. However, when one grows to the size of these global giants, there are scarcely new markets to win. One way of remaining innovative for these firms is to develop innovative services and other offerings, as well as providing ways of creating other values in addition to profit [23], for either the organization, or its customers. As competition, and thus competitive advantage, is still a central concept in economy, we look into factors that lead to gaining competitive advantage over rivals.

According to Porter, competitive advantage arises from leadership:

*“[Organizations] must recognize the central role of innovation – and the uncomfortable truth that innovation grows out of pressure and challenge. It takes leadership to create a dynamic, challenging environment. And it takes leadership to recognize the all-too-easy escape routes that appear to offer a path to competitive advantage...”* [34, p. 207].

In the process of becoming ‘elephants’, Apple, Microsoft, Facebook and other afore-mentioned companies had some rather exceptional leaders (e.g., Jobs, Gates, Zuckerberg), who also had a strong organizational vision.

In [24], Larwood et al. have conclusion their study proposing that vision is multi-dimensional, with factors for vision being formulation, implementation and innovative realism. Vision may start with “I have a dream”, where one clearly sees the goal in the future, and that is important. Being capable of implementing the vision often requires innovation. Pointing back to Cairncross [10], in IT facilitated organizations, technology has been more than powerful these last years, for further growth of the

organization and gaining the competitive advantage one needs innovative processes. A good example [17, p. 12] is how Apple created a new concept in the consumer's mind, and new relationships between its products, e.g., iPhone and iTunes or Apps Store.

Competitive advantage also grows from the particular, hard to duplicate organization-specific knowledge and resource orchestration, discussed, for example, by Sermon et al. in [39]. Since this knowledge is hard to duplicate, the companies do not compete with others, but are depending on their own capacity for using this knowledge towards innovation.

Yet another concept, that of a knowledge funnel, is proposed by Martin in [29] as a driver of competitive advantage:

*“Neither analysis nor intuition alone is enough. In the future, the most successful businesses will balance analytical mastery and intuitive originality in a dynamic interplay that I call ‘design thinking.’ Design thinking enables leaders to innovate along the path of the knowledge funnel, and the firms that master it can gain long-term business advantage.”*

This is in line with basis for grounding d-school and Owen's makers and finders categories, as described above. Abductive reasoning, or the inference to the best explanation, balances analytic and intuitive thinking and guides one through the knowledge funnel with greater reliability than the intuition alone.

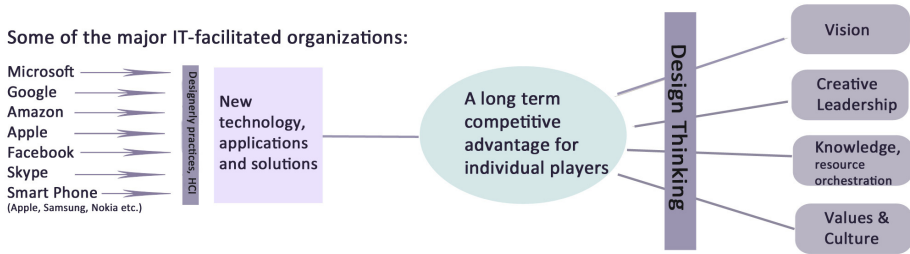
This brings in yet another discussion, that of organizational culture, and how it views innovation. A leader might be visionary and creative, but if all initiatives were stopped by rules and regulations, lack of enthusiasm among employees etc., not much innovation would happen. A culture, which supports exploration long enough to see at least two intuitive breakthroughs, has a much better chance to create truly innovative products. As above cited case of Procter & Gamble shows, even exploitation oriented organizations, can change and develop skills needed to generate value from exploration insights.

## 4 Design Thinking and Competitive Advantage Framework

From the above discussion, we view leadership, vision, knowledge and resource orchestration, values and culture of an organization, to be leading factors in creating competitive advantage for organizations facilitated by information technology. For these organizations, which are already either global or getting there, traditional factors such as clustering and geography become less influential.

Below, we offer the framework for gaining long term competitive advantage for IT-facilitated organizations, Fig. 1.

Long-term health and effectiveness of these organizations, as mentioned previously, has been described in terms of values, visions, knowledge work and creative leadership [5, 9, 23, 24]. Originally, design thinking was placed as the fifth instrumental factor in promoting this long-term health in Fig. 1, but design thinking is infusing all those factors, and has come to play a central role in them, thus the positioning.



**Fig. 1.** Framework for gaining long term competitive advantage for IT players. Exhibit: Culén & Kriger.

The interesting part of Fig. 1, from the point of view of HCID, is that HCI certainly has a role in the development of new technology, through HCID and designerly practices. However, this role is more on a micro-economic level.

To increase the influence of HCID, the HCID practitioners also need to think bigger, as they have started doing within sustainable technology design.

The sustainable technology design has become one of larger issues in the field of HCID [15]. Design thinkers have perhaps paved the road, as they have been instrumental in successfully bringing forward and addressing issues of sustainability, see for example, [4, 15, 40]. HCID practitioners, on one hand, strive to design technology that supports us in our everyday lives, to make technology easier to use, more useful, cooler, to support aging and so on. Bleviss [3] suggests explicit coupling of invention and disposal, as well as renewal and reuse when designing new products. Other researchers within interaction design and HCID are trying to understand why we keep some things and discard others [32], can we make green solutions, as well as asking questions such as: do we need all this technology [2]? And finally, there are those opting for structural change:

*“Technology creates possibilities for structural change mainly by amplifying efforts to achieve existing, institutionally recognized goals. In the context of the transition to sustainability, such goals may include the reconfiguration of institutions and infrastructures themselves. HCI can contribute significantly to the transition to sustainability by exploring how information tools can support such efforts”, [38, p. 1].*

Thus, participation in global changes would position also HCI as a more central factor in strategic innovation.

## 5 HCID and Design Thinking: The Future of the Library

We conclude this discussion on innovation, competitive advantage and the role of design thinking and HCI in innovative processes with a small case from practice.

The case is based on a public sector organization, with long and well established tradition, and until recently little urge to innovate: an academic library. For the past decade, the Internet has been a game changer for academic libraries. Appearance of

disruptive technologies, such as eBooks first, and tablets later, posed further challenges. The libraries, and in particular academic libraries, are practically forced to re-think their role in academic life, their use of technology and their willingness to innovate.

One of the authors of this paper started cooperation with the academic library approximately three years ago. At the time, the main issues the library had were around transfer of web-services to mobile devices. Since the author teaches project-based course in interaction design, several student projects for the past three years were dedicated to developing innovative information technology solutions for the library. The way the students work is very similar to Kolko's description of what design thinkers do: they make a series of rapid prototypes, evaluate them with users, brainstorm, role play, etc. until they find a concept that they want to develop further. Within a 3-month time-framework, they develop a high fidelity prototype, which is also evaluated in real use context, with actual users. Since students themselves are users of the library, the ideas they came up with were many and varied. Already after the first semester of students' projects, the library recognized the value of user-driven innovation and made resources available to support it. After the second year, some of the solutions were implemented, and found to be working well, both for students, librarians and library leadership. The "new" concept was taken in use, the concept of the living lab [12]. Now design students could work in the science library, engage other students and use design thinking to come up with more creative solutions. After the third year, a seminar about design thinking, as well as a series of workshops with focus on service design innovation were organized and carried out with library employees, including leadership, digital services, librarians and others [11]. The effect of these workshops was that library employees could experience, first hand, design thinking. They used service design cards, made and re-made customer journeys, past, present and future. The consequence of this work, summative over three years, is that we could witness emergence of creative leadership, change of culture towards exploration, change in vision, now dedicated to creating a large user experience center and changing the library status to that of a research library, change in knowledge and willingness to build competence in user experience and innovation.

## 6 Discussion and Conclusion

Considering the case presented above, as well as the attendant discussion, we find that, although HCID and design thinking both have their roles in innovation processes, in particular for IT-facilitated organizations, HCID could position itself more centrally in relation to explaining the long-term health of IT-intensive organizations.

Several future avenues are possible. HCID, for example, may focus more on sustainability issues and take a more central role as regards sustainable global development. Thus, at a minimum the position as shown in Fig. 2 should be achieved, moving the field from incremental innovations towards actively helping to shape future technology policies.



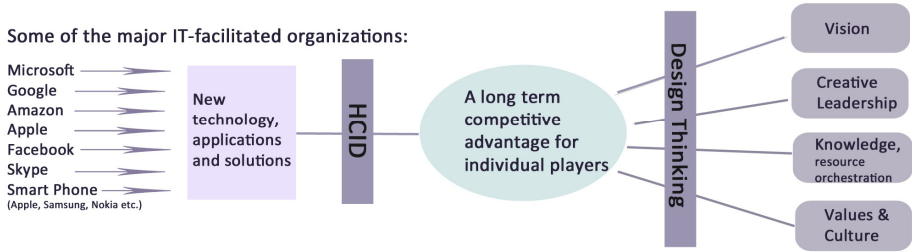


Fig. 2. Possible positioning of HCI in the framework. Exhibit: Culén & Kriger.

The future is obviously hard to predict. Distribution of wealth is at present highly uneven in the world, in both the developed and still developing countries, and as a result is not sustainable. Below is a visual summary of the above discussion, somewhat simplified, but nonetheless thought-provoking (see Figure 3).

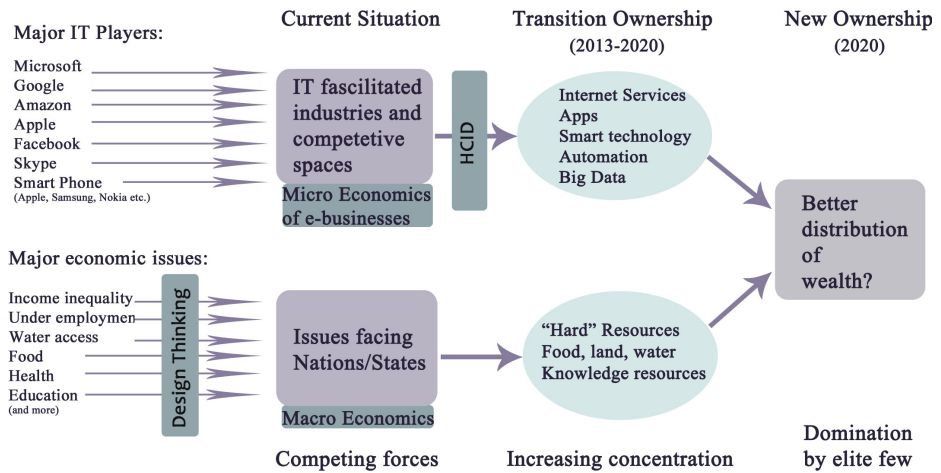


Fig. 3. How HCI and design thinking potentially influence global change Exhibit: Culén & Kriger.

### 6.1 Conclusion

This paper has explored the future role of design thinking and HCID in shaping the conditions for long-term competitive advantage for IT-intensive organizations. From a case of innovation in an academic library, where HCID and design thinking were instrumental in starting not only product and service innovation processes but also subsequent organizational changes, we find that both HCID and design thinking can be important simultaneous facilitators of change. HCID can open doors to innovation of products and services, wherein design thinking is a salient element of HCID processes and an important initiator of organizational change. However, innovation driven through HCID will not be lasting without the presence of supportive, and

larger, top-down changes. In our case, design thinking helped to change the vision and culture of a library organization. A limitation of the current study is that it uses a single case to provide empirical justification. Future research is called for using a larger and more diverse sample of organizations. Such future research might aim to provide answers the following: (1) a detailed understanding of the processes by which such changes happen, (2) what sets these changes in motion in the first place, and (3) what causes the results of the change process to endure over longer periods of time.

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