

## **Emergence and knowledge in Design Management**

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### **International DMI Education Conference**

**Design Thinking: New Challenges for Designers, Managers and Organizations**

**14-15 April 2008, ESSEC Business School, Cergy-Pointoise, France**

## **Abstract**

This paper seeks to draw relevant conceptual and practice-based examples of the application of the idea of emergence to design thinking. Specifically, it will examine the relationship between linear and hierarchical thinking in organizations on the one hand, and diversity and complexity in the larger stakeholder community (user group, audience or marketplace) on the other, using the model of Design Management education as its metaphor. It asks how characteristics of complexity and emergence might be identified in both Design Management practice and Design Management education, and suggests ways in which positive interventions might be made to encourage beneficial aspects of these phenomena.

The popularisation of the idea of emergence, or the science of complexity, has begun to manifest itself in the business models of some of the twenty-first century's most dynamic enterprises. Google, Facebook, MySpace, Amazon and Second Life have all, to some extent, abandoned the traditional product-merchandise paradigm, and have embraced user interaction at a social and cultural level, rather than a purely transactional level. The widely discussed notion of 'Web 2.0', in which the content, interface technology and overall character of the web are identified as a bottom-up, self-organising function of the user base, is a similar, if somewhat more contentious, application of the concept of emergence; individuals, subject to relatively simple constraining factors, create through participation and iteration, a highly complex and diverse system of emergent communities.

Emergence poses several challenges for the discipline of Design Management: some practical, and some conceptual. Existing theoretical models of, for example, brand valuation and buyer behaviour, are in general based on linear, sequential models (see, for example, Kent and Omar. 2003), which take little real account of the emergent nature of peer group formation and self-identification.

## **Complexity and emergence**

Complexity theory emphasises factors which in other analytical models are characterised as merely ‘noise’: individuality, the apparently marginal and seemingly accidental. Manifold interactions among elements are responsible for the phenomena that characterise the field. It is the connectivity and diversity, and indeed the complexity of the complexity, that matters. ‘A central concern with complexity theory is with relationships between elements in a sufficiently complex system or environment’ (Mason, 2008).

Complexity theory concerns how new properties and behaviours which are necessarily contained in the essence of the constituent elements of a given system will emerge. These emergent phenomena can form a critical mass leading to a fundamental systemic change. Complexity theory suggests that it is in the dynamic interactions and adaptive orientation of a system that new phenomena and new properties and behaviours emerge. Therefore, the focus is on the contextual and contingent complex whole, which creates a momentum of its own (Mason, 2008). Complexity of a phenomenon can be defined by a number of characteristic qualities: self-organisation, bottom-up change stimulus, short-range relationships, and nested structures which are ambiguously bounded, organisationally-closed (meaning inherently stable), can change structures, do not operate in equilibrium. In the educational context, these can apply to bodies of knowledge, class dynamics, and institutional organisation (Davis and Sumara, 2006).

Models of complexity are based on the aggregation of local interactions, as demonstrated by Reynolds’ (1987) ‘agent-based modelling’, which focuses on individual agents and their interaction at the relational level (Macy and Willer, 2002). Complexity examines how components of a system ‘spontaneously’ develop collective properties or patterns through their interaction. It ‘... investigates emergent, dynamic and self-organizing systems that co-evolve and adapt in ways that heavily influence the probabilities of later events’ (Urry, 2006). Complexity is also underpinned by an apparent lack of proportionality between

‘causes’ and ‘effects’. Emergent patterns of behaviour, which share a similar essentially simple governing algorithm, can be observed in the behaviour of social insects such as termites (Johnson 2001).

Emergence has developed out of the sciences of complexity, and through the study of interaction rules and, in opposition to reductionism, generates the ‘properties of the whole from an understanding of the parts’ (Morowitz, 2002). It proposes that complex and diverse self-organising systems can emerge from relatively simple rules and algorithms, and that these systems exhibit characteristics in their totality that are not present in the individual elements. Hence the human brain can exhibit consciousness, but an individual brain cell does not.

Emergence has been applied in a number of disciplines. Clayton describes emergence as ‘the theory that cosmic evolution repeatedly includes unpredictable, irreducible, and novel appearances’ (2004, p.39). Seen through the lens of emergence, a ladder-like view of the world takes shape: physics, chemistry, biochemistry, biology, consciousness, transcendence. However there is a need for metaphors and visualizations to express the interplay of continuity and discontinuity, of relatedness and distinctness. Such visualizations should combine the message of both levels and loops (Jackelén, 2006).

Any change in the parts of the system affects the whole and its parts; consequently, change is due to the specific configuration of the system rather than single factors, and is largely unpredictable. Emergence, here, is the appearance of a new form or entity due to the organisation of the whole. It is not that the sum is greater than the size of its parts but that there are system effects that are different from its parts (Urry, 2006).

Positive feedback plays a central role in emergent systems. ‘The spontaneous dynamics of living systems result from positive feedback or self-reinforcement characterised by the increased incidence and significance of initially apparently trivial events in the circumstances, initially random they become self-

sustaining [...] “autocatalytic” (Mason, 2008). This feedback is an essential element of change, of surprise and of life itself. In social sciences, this requires intervention at many levels, macro-structural, intentional human agency level, to create sufficient momentum in a direction to displace the current momentum and set off in another direction. Small chance events become magnified by positive feedbacks. This provides a theoretical basis to explain the Tipping Point (Gladwell, 2000): through stages of gaining mass, a sequence of self-reinforcing, apparently trivial events result in emergence, and a new organisational direction or organisational ‘shape’.

### **Complexity and pedagogical theory**

Marková and Plichtová (2007) demonstrate how systemic change takes place in a collaborative research project. Here the system comprises ‘researchers; interactions between them (face-to-face, mediated through the internet, etc.); all the objects that mediate them (papers, computers, data, existing knowledge); the participants, if any; each of the actors’ perspectives; and goals. It is also shaped by the symbolic and material powers of the institutional environment of research, which assigns roles and hierarchies to researchers, allocates access to means, and can control goals or available time’. Changes can be qualified as emergent at any level; one person in a research team comes to a totally new understanding, that the team as a whole produces new software, or that the collaborative project defines a new general research question.

Emergent properties can indeed be said to occur not only in group learning enterprises, but also in the individual. Meyer and Land’s model of threshold concepts<sup>1</sup> suggests that transformative development in

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<sup>1</sup> Meyer and Land (2003) describe the characteristics of threshold concepts in learning as follows:

a) Transformative, in that, once understood, its potential effect on student learning and behaviour, is to occasion a significant shift in the perception of a subject [...]

learning occurs as a series of gates through which the learners passes and which result in a changed perspective:

‘A threshold concept can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress. As a consequence of comprehending a threshold concept there may thus be a transformed internal view of subject matter, subject landscape, or even world view. This transformation may be sudden or it may be protracted over a considerable period of time, with the transition to understanding proving troublesome.’ (Meyer and Land, 2003).

Davis and Sumara (2006) examine the proposition that education is concerned primarily with fostering the emergence of learning, of creativity of imaginative and critical perspectives. They investigate how complexity theory could either establish, or contribute toward the conditions for potential emergence to occur in a pedagogical context (see figure 1).

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- b) Probably irreversible, in that the change of perspective occasioned by acquisition of a threshold concept is unlikely to be forgotten, or will be unlearned only by considerable effort. [...]
  - c ) Integrative; that is, it exposes the previously hidden interrelatedness of something. [...]
  - d) Possibly often (though not necessarily always) bounded in that any conceptual space will have terminal frontiers, bordering with thresholds into new conceptual areas. [...]
  - e) Potentially (and possibly inherently) troublesome.

Extent of internal diversity of agents that constitute the system	Positive feedback loop dynamics
Internal redundancy of elements ('redundancy' meaning what is common amongst them)	Sufficient means to capture and preserve information
Extent of neighbour interactions	Flow of information through the system
Decentralisation of control = emergent conceptual possibilities, not <i>laissez faire</i> classrooms	Stability under perturbations
Extent of randomness in the system and its environment (these are closely connected)	Reproductive instability (room for error) for emergence of variations of relatively stable patterns
Extent of coherence in the system	Richness of connectivity
Negative feedback loops keep the system in check	Scale of the system – complexity only emerges in systems of sufficient scale
	Exponential rather than linear

Figure 1 Conditions for emergence in a pedagogical context (Mason, 2008)

This suggestion of a dialectical relationship between teacher and learner, between environment and context, and between content and discourse, is a crucial area of opportunity for educationalists in the Design Management sphere, and one to which we will return later in this paper.

### **Top-down theories of Design Management**

Design has been traditionally conceptualised in terms of products and outcomes, as opposed to experiences and processes. Even relatively recent discussion of design and emergence is couched in these terms; 'design that creates new functions or makes a tool more functional or easier to use. Design that

adds value to a tool (i.e., any product) or service, above and beyond its functionality' (Van Alstyne and Logan, 2007).

Orthodox perspectives of Design Management propose that key elements of the design process are clarification of the need for design, and the project's objectives, preparation of a brief, idea generation and concept development, detailed design, production and implementation, evaluation (Bruce and Bessant, 2002). These models of Design Management generally stress the rationalising and objectifying role of the design manager in teasing out of what had been previously an implicitly intuitive and amorphous project, by using the techniques of scientific management (Taylor, 1972), namely systematic analysis of processes and the division of labour. 'Designing involves people, a design team with the appropriate expertise, undertaking a process, a sequence of activities arranged into phases and steps, to define a product, its configuration, components, materials and construction (Pahl and Betz, 1996). The immediate context for this activity is the organisation within which it takes place, and which provides the necessary infrastructure and resources (Pahl and Betz, 1996). This engineering-led approach places design in a particular context, which is aligned with Jean-François Lyotard's concept of performativity<sup>2</sup>; that is, the knowledge thus produced is both a commodity in itself, and at the same time is an economic prime mover. However, a conflict emerges between this orthodox, top-down model, with its tendency toward normalisation of the status quo and preservation of stability on the one hand, and the need for bottom-up, disruptive innovation, in the form of Joseph Schumpeter's 'creative destruction' (Schumpeter, 1954), on the other, if organisations (and indeed whole economies) are to avoid entropy.

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<sup>2</sup> 'The true goal of the system, the reason it programs itself like a computer, is the optimisation of the global relationship between input and output, in other words, performativity. Even when its rules are in the process of changing and innovations are occurring, even when its dysfunctions (such as strikes, crises, unemployment, or political revolutions) inspire hope and lead to belief in an alternative, even then what is actually taking place is only an internal readjustment, and its result can be no more than an increase in the system's "viability." The only alternative to this kind of performance improvement is entropy, or decline.' (Lyotard 1979)

A detailed summary of the process of design activity by Clarkson and Eckert (2005) classifies models of designing as stage-based and activity-based. Most procedural models present design as a series of stages, each of which is visited once during the ideal process. However, it has been observed that design practice is characterised by complex interdependencies, and that a linear process alone cannot work; the need instead is for iterative processes, which are fault-tolerant and can be adapted and refined in the light of experience. Pahl and Betz (1996) believe that the most challenging problem in design is the creative leap from problem definition to solution concept: 'Even the simplest design process is a highly complex socio-technical activity requiring a much broader ranges of skills from marketing to HRM. [...] The primary difficulty design companies face lies in the integration of diverse methods, disciplines, tools and personnel' (Pahl and Betz 1996).

### **Design processes and emergence**

Clarkson and Eckert acknowledge the problematic relationship between theory and practice in the field of Design Management where 'a key weakness of all the literature reviewed here is the difficulty of application to real design solutions' (Clarkson and Eckert, 2005).

In both academic and practical worlds, a multitude of complex systems results in the interweaving of foreground and contexts (Lissack, 2004). In management studies, it has been observed that complex systems give rise to variety, and consequent adaptive responses. Variety grows from diversity of organisational strategy, structure and process as well as from change in environmental forces such as technology or social norms (Murray, O'Driscoll, and Torres, 2002). In a similar fashion, brand identities and mythologies emerge that are not solely the products of a marketing manager's intention, but are (more significantly) the result of complex interactions between the brand, its market, and the larger socio-cultural context in which it operates. We observe this process in the example of the corporate and retail brand identity of The Body Shop, later in this paper.

## **Knowledge Management as context for emergent properties in Design Management**

Design Management has an underlying objective to establish a 'know-how' of design practice internally (de Mozota, 2003), beginning with competent collaborators in the design department, supported by technical and specialist skills. The role of the design manager is to network throughout the organization, to disseminate design knowledge. This dissemination can occur through training, contact, listening and communicating. In this respect, Knowledge Management can be seen as a key focus for the discipline of Design Management: 'expertise possessed by designers plays a significant role when solving problems, as does the nature of the situation. [...] For the members of the design team, knowledge links everything together and enables them to make decisions that direct the process and determine its outcome' (Pahl and Betz, 1996).

What is stored and transferred outside out mind is information. Knowledge only exists when information is interpreted. Knowledge can be defined as any data, skill, context, or information that enables high quality decision making and problem solving to occur.

Knowledge Management is the process through which organisations generate value from their intellectual and knowledge-based assets; most often, generating value from such assets involves sharing them among employees, departments and even with other companies in an effort to devise best practices (Santokus and Surmacz, 2005). As Riege, (2005) observed 'in a knowledge-driven economy, organisations' intangible assets are increasingly becoming a differentiating competitive factor, particularly in services industries' The process of capturing, organising and disseminating information is at the heart of the discipline of Knowledge Management.

Knowledge Management, in its social, organisational and networked forms, stresses the importance of social interactions. As a disciplinary component of Design Management, it is in a process of evolution; the top-down (or highly centralised) model of information collation and dissemination is being

complemented with (and, in some cases, replaced by) a more decentralised and informal approach. As such, it accommodates a much wider range of stakeholder views, including those from outside the organisation. The traditional methods of market and consumer research are being augmented by less formal transmission and feedback channels, which frequently exhibit aspects of self-organisation. An example here would be the user reviews and author comments on websites such as Amazon, as well as seller and buyer feedback on eBay, and the phenomenon of corporate blogging. Online communities such as Wikipedia communicate in a 'bottom-up' way (albeit using pre-existing resources and pre-determined architectures of information), and, in so doing, also produce new knowledge.

The process of knowledge creation and transfer within organisations generally occurs when groups work together to solve complex problems and much of the Knowledge Management literature stresses the social context of knowledge creation (Walker and Christenson, 2005). While traditional hierarchical management structures allow vertical knowledge transfer through typical chain-of-command, they can also tend to inhibit horizontal transfer between functional departments or business units (Walczak, 2005). The level of trust between a company, its sub-units, and its employees seems to have a direct influence on the communication flow and thus the amount of knowledge sharing within and between business functions or subsidiaries (De Long and Fahey, 2000; McAllister, 1995 quoted in Riege, 2005). Moreover, organisations usually import a substantial part of their knowledge from outside sources. Relationships with customers, suppliers, competitors and partners in cooperative ventures have considerable potential for providing knowledge (Lin, Yeh, and Tseng, 2005).

A Knowledge Management-oriented view of the practice of Design Management, which recognises the emergent properties of organisational learning and collaborative knowledge production, might cast the Design Manager in the role of strategist and negotiator, organising networks of relationships to breed a fitter species, where form is the expression of the interaction, and is not pre-ordained and fixed (Watts and Strogatz, 1998). Much has been written on the subject of so-called 'T-shaped' people in design; those

with depth of understanding in design activities, and breadth of understanding of adjacent disciplines and organisational functions. More generally, senior managers in non-design roles have been encouraged to think of themselves as facilitators of creativity and innovation (see, for example, Nussbaum 2007); clearly, this presents a challenge for business management education, and for conventional methods of managing risk and rewarding achievement.

One problem in identifying patterns of emergence in existing Design Management practice centres on how to relate these ideas to empirical study of design in very different contexts. The question arises whether this approach retains its relevance regardless of the specific culture, environment, stakeholders and intended outcomes. In a continuing programme of research, we have examined aspects of Design Management at the UK food retailer Waitrose, and aspects of brand development and reception at the UK-based retailer of health and beauty products, The Body Shop.

### **Waitrose as an example of complexity in stakeholder communications in Design Management**

The experience at Waitrose suggests that, while it operates within many constraints and has multiple success criteria, the practice of retail design is primarily about the brand, and how it is represented within the retail environment. Customers, and their perception of the retail environment in the larger context of the product and brand, are of course a key stakeholder group. However, the situation is one of increasing complexity, with more stakeholders becoming involved in the store design and development process, including:

- board-level engagement, representing acquisitions and commercial expansion;
- senior finance and property managers;

- buying and merchandising teams, with an understanding of trends forecasting and buyer behaviour; and
- local store management, representing operational concerns such as logistics and staff orientation.

This complex network of internal stakeholders is mirrored by a larger community outside the organisation, such as local communities, planning departments of local authorities, neighbourhood shops and businesses etc.<sup>3</sup>

As a business process, retail design is subject to powerful contradictory forces: on the one hand, it is reactive, recognises fashion, and can occur directly as a response to competitive threat (such as a rival retailer opening nearby); businesses and customers alike have become more sophisticated, and seek core values with more integrity, and greater subtlety. Service (and its communication) has become more important.

On the other hand, however, the need for consistency in corporate brand identity brings long-term and larger-scale implications. Although the retail brand identity needs to evolve to keep it in tune with the market and contemporary thinking, it cannot do so at such a pace that it creates confusion and a lack of perceived focus on the brand characteristics in the mind of the consumer.

This complexity brings rewards and frustrations to the Design Manager. The rewards of a wider stakeholder participation in the design process derive from the increased understanding of and respect for the strategic importance of the design function, and the opportunity it provides for trans-disciplinary, collective learning. Paradoxically, frustrations for the design manager lie in much the same areas. The fact that stakeholder clients are more demanding without necessarily having the opportunity to become more

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<sup>3</sup> For a fuller discussion of stakeholder networks in retail store design and development, see Kent and Stone (2006).

knowledgeable, and the potential for abrupt changes of direction due to the varying influence of each group as the project progresses, can lead to tactical problems, aborted work, and reduced strategic clarity and focus.

The key lessons that emerge from this collaborative model, with its wider network of stakeholders, are two-fold:

- because of the inherent complexity of multidisciplinary working, small things and subtle changes can make a large difference in the design process; and
- knowledge acquisition is both a formal and informal process – it is very easy to underestimate the amount of knowledge required, from many people at many different levels in the business, for a successful design process.

### **The Body Shop as an example of emergent properties in the formation of brand identity**

The Body Shop presents a useful illustration of the emergent properties of brand identity. This identity is constructed not of material assets or human resources, but instead exists as a narrative which has been constructed collaboratively by the organisation itself and the marketplace within which it operates.

Although The Body Shop has frequently been cited as an exemplar of good practice by brand practitioners (Olins 2003) and by designers (Design Week 2005), there is ample evidence to suggest that the organisation itself implicitly rejected the very idea of a brand identity, during its formative years at any rate. The emergence of the visual and other aspects of the Body Shop's brand are, in many biographical accounts, played down; Roddick herself described the organisation's logotype as 'having been done by some kid in Brighton for 25 quid' (Design Week 1997), and another source implies that the brand's dark green colour was chosen because of its ability to hide patches of damp in the original store ([www.worldaware.org.uk](http://www.worldaware.org.uk)).

The Body Shop's position as an iconoclastic organisation has however generated its own mythology, which has in turn formed part of the narrative that is its brand perception. Even its origins are somewhat confused – most accounts of the company's beginnings stress Roddick's early attempts to put together a basic range of products and find a manufacturer for these, and invite the reader to infer that serendipity and imagination were the key factors in the formulation of the Body Shop proposition. However, one account suggests strongly that the name, the trading format and the promotion of environmental concerns were in fact inspired by a shop of the same name in the San Francisco Bay Area, that Roddick had visited in 1970 (Entine 2007).

The organisation's early trials and tribulations have become part of what could be termed the Body Shop's 'folklore'. The company's inauspicious beginnings, and its ultimate triumph over adversity, feature strongly in many profiles, and these anecdotes frequently reinforce a message of self-belief, persistence and resourcefulness when faced with problems. Two funeral directors near Roddick's first store in Brighton felt that the name 'The Body Shop' was likely to harm their businesses, and so sent a solicitor's letter threatening to sue her (The Telegraph 2001). She responded with a tip-off (anonymously, in some accounts) to the local paper, characterising the dispute as a David-and-Goliath struggle between her nascent enterprise and 'Mafia undertakers who wanted to close me down' ([www.growingbusiness.com](http://www.growingbusiness.com)). The story of this early publicity coup has been re-told and re-interpreted many times, and lends to the organisation's brand image a resonance and depth which could come only from an oral history tradition.

The Body Shop demonstrates the power of self-organisation in the reception and dissemination of brand messages among customers and other stakeholders; it is precisely the emergent nature of the identity – which, rather than being dictated in a top-down fashion by the organisation, is negotiated between the consumer and the organisation – that gives it its longevity and clarity.

## **Conclusion: complexity, emergence, and the challenges for design thinking and Design Management education**

Social networks comprise people, machines, animals, art, discourse, architecture, and more form a vast network of human and non-human interactions (Law, 2007). In participatory design situations the competence of the facilitator will influence the opportunities for a user group to become engaged in the process of design (Luck, 2007). Moreover scale, time and place combine with external factors to change the processes and approaches people take in their organizations, and such contextualization can create more powerful ways of talking about Design Management (Sermon, 2007). Empirical studies in the service industries explain the activity of design as a form of social constructivism which acknowledges that design is socially constructed through interaction. This research builds on this body of work but specifically attends to how design facilitation as an expertise is produced in multiple interactions.

Complexity and the application of collective intelligence in design can be found in the relationship of design technology and products to emerging technological and material systems, particularly those relating to 'smart' or intelligent modes of behaviour. Hight and Perry (2006) suggest a reformulation of practices around networked communication infrastructures, as conduits for new power. Responsive sensing environments can be new sites for social organisations and communities through Internet and telecommunications. The boundaries of traditional design disciplines and knowledge are opening into complex co-minglings. In other words, hybrid intelligent technological and material systems are increasingly evident (Hight and Perry, 2006).

Mason's (2008) proposal that new properties and behaviours emerge when sufficient numbers and varieties of elements or agents cluster together to provide a complex arrangement of incredible scale in

which exponential growth can take place. Such a scale can be created through the use of online connectivity and adaptation of social networking sites. In this context, Design Management education should be engaged in inter-organisational co-operation in its widest. Design managers must be well placed to facilitate emergent change by resisting top-down change programmes and advocating appropriation by groups of agents in their environments. Change is first a transformation of a system of action, requiring attention social relations, regulation and social control. The challenge for Design Management is to determine how connections can be created in complex design environments, and who should be involved.

The challenge for design thinking is to re-cast the ebb and flow of the design process (Press and Cooper, 2003). Emergence enables participative research and communication on a larger scale. Consumers and users have already demonstrated the conceptual ability to engage with virtual artefacts that have emerged from the complexity of mass participation. Traditional design thinking, within both organisations and in education, is to a large extent still grappling with the problems of the physical, tangible realm. The definition of product design suggests that what emerges from it must by its nature be autonomous and de-contextualised from the social, cultural and technological matrices which gave rise to it in the first place.

A purely product-focused definition of Design Management will tend to focus on who 'owns' the design process, and how this authority is negotiated within the organisation. In this regard, the disciplines of Design Management and product design currently lag some way behind user and consumer thinking. Consumers have already demonstrated the conceptual ability (and, indeed, the eagerness) to engage with virtual artefacts, such as web-based communities, that have emerged from the complexity of mass participation. Issues of authorship and control, in this context, become less important, and the experiential aspects of iterations within the creative process become more important than a finite outcome or 'end product'.

Provisional conclusions of this paper suggest that the challenge for design thinking is to move away from 'product' thinking to 'service-brand' thinking. Design management's place within the organisation will continue to be negotiated, and as such it risks being marginalised or eclipsed entirely, if it fails to recognise and adapt to the new lexicon of complexity, and to accommodate the lessons of self-organisation among the user community that have already emerged in other areas such as software development. Design Management education can, as a critical and innovative partner to Design Management practice, take a key role in moderating the debates, undertaking the research and developing the methodologies to facilitate this.

Design Management should, in our opinion, resist the urge to attempt a project of consolidation, and the creation of a canon of knowledge; rather, it should embrace disciplinary innovation, as a bulwark against entropy. By exploring and employing new tools, techniques and approaches in a reflexive way, such as action research and ethnographic and other observational research methods, it can itself become the subject of a process of evolutionary transformation.

Research practices can engender other sorts of knowledge (Zittoun et al. 2007). In particular, the emergence of unexpected events can be seen as an invitation for researchers to reconstruct the events that led to the new perspective obtained. Through this reflective stance, non-negligible, yet not sufficiently validated knowledge is produced: knowledge about collaborative research. In other words, knowledge arising from reflecting on the collaborative processes of Design Management.

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