

# Kansei-related design information exchange during early concept creation phases

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**Abstract:** In this paper the authors will investigate early experience-centred design activities. Twenty-seven past industrial design projects were analysed. Information was gathered from interviews with former project team members and from an analysis of the projects' final reports. All of the projects involved the Toyota Motor Europe – Kansei Design (TME-KD) division. Three types of projects were identified: “exploratory concept,” “product lining strategy,” and “pre-development direction.” The analysis will show that these project groups not only each have a specific context (purpose, design team members, audience) but that their outputs are also different regarding the type of design information they convey. This will lead to a comparison of the different typologies of projects and a discussion about the kansei-related design information exchange in early design stages. A model of kansei-related design information based on these discussions will be presented.

**Keywords:** kansei design, design information, early design stage, industrial context.

## 1. INTRODUCTION

In the consumer goods industry, design teams include members with diverse profiles, such as marketing product planners, engineers, and styling designers. Initially, the design team usually identifies problems and defines challenges in a document often designated as the “brief.” Before any concrete aspects (e.g., shape, technology specification) of the product to be designed are fixed, other representations appear in the process. These representations (e.g., mood-boards, target customer description, technology demonstrators, etc.) convey intentions and possible directions. They can be seen as communication tool to increase mutual understanding of the concept and facilitate discussions about specific topics between the diversely skilled members of a design team.

These representations all touch on aspects of user experience, but they never communicate any clear intention related to it. Nevertheless, user experience is at the boundary between the three main functions involved in design teams (marketing, engineering, styling) as it relies on an affective link between a user (i.e., market) and the environment (including the product, the interaction, the context). Users' experience with products recently became a major differentiation factor between competitors and can greatly influence the success of a product. Karapanos and Martens (2009) stated that decisions made at the conceptual design stage have the highest impact on the final user experience (UX) and eventually on UX failures. From this statement, we postulate that taking experience into account and discussing it early in the design process increases the chances that the final product will have a positive impact on its users' kansei.

In this paper, different uses of kansei representations in the industrial process will be investigated. In order to do so, 27 early-design projects leading to the creation of kansei representations were analysed. These projects, which took place between 2008 and 2013 and were coordinated by the TME-KD division, can be characterised as experience design-driven NCD projects.

## 2. LITERATURE REVIEW

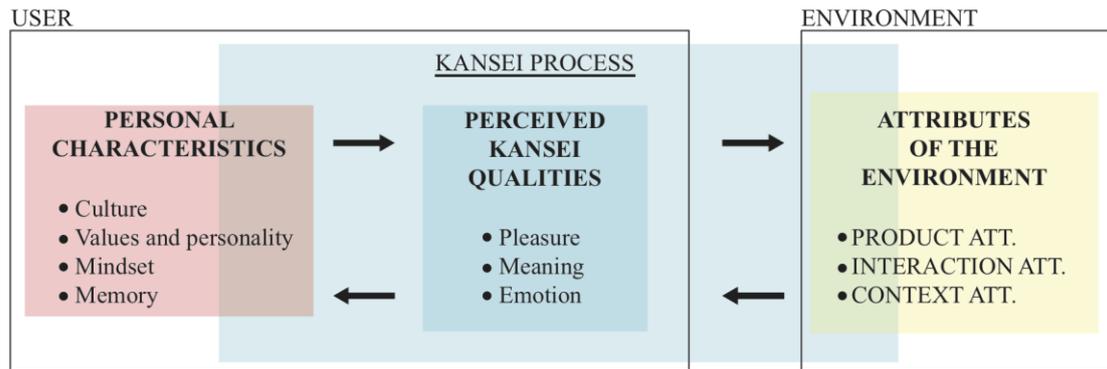
The first section of the literature review will create a link between the complementary notions of user experience and kansei process. The second section will detail the early phase of the industrial design process, and the final section will investigate the literature related to the design information exchanged within a design team during this phase.

### 2.1. User experience and the kansei process

Ortíz Nicolás and Aurisicchio (2011) analysed 11 user experience frameworks from the literature in an attempt to bring together in a consistent overview the rapidly growing and disjointed literature on the subject. The conclusion of this research suggested that even if the perspectives and focus points of the 11 researchers were different, common constituent elements (user, interaction, artefact, context) and aggregates (subjective, conscious, emotional, interconnected, dynamic) of user experience were acknowledged by the majority of the perspectives reviewed.

The situation described with the term *user experience* can be understood in relation to the definition of the *kansei process*. Lévy, Lee, and Yamanaka (2007) described the latter as the function of the brain related to "emotions, sensitivity, feelings, experience and intuition, including interactions between them" (p. 9). It is further described as originating in one's sensory perception and personal characteristics (*kansei means*) and providing as output a qualitative meaning and value of the environment (*kansei result*). Notably, Lévy et al. indicated that the flow between *kansei means*, *process*, and *results* is not strictly linear and that these different aspects influence each other.

Figure 1 represents a framework that combines the notions of user experience and kansei process. It represents the main entities of an experience during the interaction between a user and a product. The *personal characteristics* and *attributes of the environment (product, interaction, context)* cover what has been previously defined as *kansei means*, whereas the *perceived kansei qualities* are direct consequences of *kansei results*. Notably, the framework also retains the four constituent elements of an experience identified by Ortíz Nicolás and Aurisicchio (2011). More details about the creation of this framework can be found in another publication (Gentner, 2014).



**Figure 1:** Kansei-experience framework

## 2.2. The new concept creation phase of the industrial design process

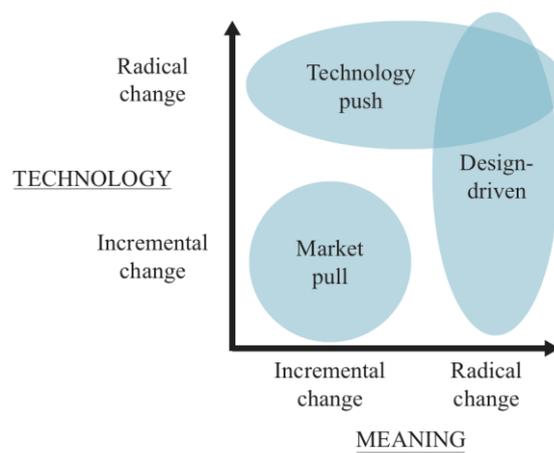
Scholars usually divide the industrial design process into two major phases: the new concept development (NCD) phase and the new product development (NPD) phase (Cooper, 2008; Buijs, 2012). The NPD phase then leads to the commercialisation of the new product. Gero (2010) described an *innovation* as the introduction or uptake of intellectual property (created during the NCD phase) into NPD projects (during which the consumable artefacts are designed). This means that both phases (NCD and NPD) are necessary for the innovation process. This definition of innovation also corresponds to that of Van de Ven (1986): “new ideas that have been developed and implemented” (p. 590). Depending on the changes they involve, innovations can range from incremental innovation to radical innovation. Their nature also impacts the typology of products to which they are related (Wheelwright & Clark, 1992). In that sense, the nature of the intellectual property created determines the product development strategy that will be adopted by the project managers (Verworn & Herstatt, 1999).

Wheelwright and Clark (1992) distinguished between three main typologies of new products: *breakthrough products*, *platform products*, and *incremental products*. These typologies characterise products based on the extent of product and process change induced by their development.

- *Breakthrough products* involve the most product and process changes. In the automotive industry, the introduction of the first hybrid vehicle in the 1990s and electrical vehicle in the 2000s are good examples of *breakthrough products* (in these cases, the breakthrough innovation came from the engine).
- At the other extreme, *incremental product* developments involve only few process and product changes. In the automotive industry, such developments correspond to small vehicle updates that occur usually three years after the launch of a new vehicle. They involve minor styling and performance changes (but not deep architecture changes).
- In between these two extreme typologies are *platform product* developments. These developments establish a basic architecture for a next generation of product or process and are substantially larger in scope than *incremental products* (Meyer & Lehnerd, 1997). The introduction of a new vehicle and the addition of new body styles (e.g., coupe, convertible, station wagon) are the result of *platform product* developments.

Verganti (2009) identified three types of innovations: market pull, technology push, and design driven innovations (Figure 2). Market pull innovations correspond mostly to *incremental products* and are based on needs expressed by customers. Criticisms from scholars regarding this type of innovation are that customers (the market) have a short-term view and that their requirements are neither fully explicit nor stable (Sandmeier et al., 2004; Norman, 2010). This is why market pull innovations alone cannot induce the changes and intellectual property necessary for the

development of new *platform products* and *breakthrough products*. In recent years, new *platform* as well as *breakthrough products* (and services) providing new and well-achieved experiences gained in importance (e.g., Nintendo Wii, Apple music and app ecosystems) (Verganti, 2009). When dealing with NCD activities, organisations are shifting from a technology-only focus (the two examples given previously do not necessarily have the most advanced technical specifications) to a combination of technology- and design-driven approaches. The latter approach enables organisations to better deal with user experience and concepts that radically influence the meaning of the product. Scholars indeed highlighted both the nonsense of NCD processes focused only on users and their needs, and the importance of considering the UX at the conceptual stage (Norman, 2010; McCullagh, 2010; Karapanos & Martens, 2009).



**Figure 2:** Types of projects at the origin of different innovations (Verganti, 2009)

### 2.3. Design information

Bouchard, Kim, and Aoussat (2009) studied the design information expressed by design team members when discussing and brainstorming about design intentions during early NCD design-driven activities. The authors gathered design information from empirical studies. They organised it into different design information categories, which were structured into three different groups depending on their abstraction level. The three groups identified corresponded to low, middle, and high levels of abstraction.

- *Low-level design information* corresponds to concrete and sensory attributes mainly related to the artefact to be designed (colour, shape, texture).
- *Middle-level design information* puts in relation abstract and concrete design information. It links abstract design information (i.e., high-level) with information describing a design solution (i.e., low-level). Middle-level design information corresponds to intended functionalities, as well as to the context and sectors or objects used as references.
- *High-level design information* corresponds to abstract information that corresponds to the user's personal characteristics, the user's perceived kansei qualities, and the attributes of the product (users' personal value, semantic words describing the experience, and style inspirations related to the future product).

Each category of design information has been defined and exemplified by Kim et al. (2009). This contribution has been used as a major input for this experimentation and is further detailed in Table 1. Notably, the categories identified by Bouchard et al. (2009) and described by Kim et al. (2009) all relate to the different entities of the intended experience (user's personal characteristics, perceived kansei qualities, product attributes, context attributes) (see also Table 1).

### 3. RESEARCH QUESTION AND HYPOTHESIS

The research question combines the notions of “kansei,” “new concept creation,” and “design information” described in the state of the art. The research question can be formulated as follows: *What are the design information categories that kansei-focused activities can cover in the early concept creation phase?*

One hypothesis was identified in order to discuss the research question:

H - The design information exchanged during early design activities depends on the typology of the project in which these activities take place.

### 4. PRESENTATION OF THE EXPERIMENTATION

#### 4.1. Data gathering

The projects were selected because their outputs described a user experience intention. For each of them, the projects’ material (including a description of the design process and final reports) was analysed and used as an input. Interviews related to each project were also conducted with at least one member of the original project team. The interviews were semi-directed. Approximately 30 minutes were spent for each project. Similar questions were asked each time to clarify the context of the projects. Discussions focusing on the output material (early representation) were then initiated. This part of the interview permitted the gathering of additional information related to the category of design information on which the resulting early representations were focusing.

#### 4.2. Context of the projects

The projects were structured according to their position on the overall operation procedure of the company. Three typologies were identified from the 27 design-driven NCD projects analysed. These typologies are related to the creation of “exploratory concept”, “product lining strategy”, and “pre-development direction.” During the interviews, the context of the project (in regards to one of the three below types) was discussed and specific attention was paid to the project’s purpose, the composition of the design team (culture and affiliation of the members), and the audience addressed by the project.

- The “exploratory concept” group is composed of design-driven NCD projects that intend to explore innovative possibilities able to provide new pleasurable experiences, including new meanings (Verganti, 2009). These projects intend to influence the development of *breakthrough products* as defined by Wheelwright and Clark (1992).
- “Product lining strategy” projects are NCD projects meant to impact upcoming *platform product* development projects (e.g., hybrid vehicle NPD projects). Their outputs highlight kansei directions and related design strategies. They provide material related to user experience that enriches downstream NPD information activities.
- The purpose of “pre-development direction” projects is to prepare an upcoming *incremental product* NPD projects. Similar to “product lining strategy” projects, they intend to communicate kansei directions and related design strategies. As the focus here is on user experience and not on style, these strategies are centred on the kansei qualities that can be expressed by different variations (or grades) of a vehicle update.

#### 4.3. Design information conveyed

In order to classify the design information conveyed by the kansei representations created in the projects, categories were created based on those proposed by Kim et al. (2009). In order to better fit to the experience design focus of the projects, some of the original categories have been adjusted (i.e., extended, divided, or combined). New categories have also been added. Table 1 presents the

19 categories of UX-related design information used for the analysis.

The *action enabled*, *product characteristics*, *interface characteristics*, *engagement required*, *gesture*, and *feedback* categories have been extracted from the original *functionality* category. This was done in order to better identify the nuances of the latter category in terms of design information in regards to related UX entity and level of abstraction. Notably, Kim (2011) identified that this category of design information was the most used during design activities. The new categories should therefore permit refined observations. The original *context* category was extended into *physical* and *temporal context* and the *texture* category was extended to *tactile attribute*. The extensions permitted to cover more accurately these two attributes of the environment of an experience. Some original categories were also grouped. This reduced the unnecessary complexity and eliminated notions that were not the focus of this research. *Form* and *colour* were combined into *visual attribute*, and *analogy* and semantic word were combined into *semantic descriptor*. Finally, several categories were also added that correspond to the design information that was observed during the data gathering and the previous experimentation but was not originally described. The categories were created in order to fit to the user experience framework introduced in the state of the art and used in the previous experimentations detailed in this dissertation. The new categories are *emotion*, *lifestyle*, *culture*, *morphology*, *auditory attribute*, and *olfactory attribute*.

**Table 1:** Categories of design information used

Category name	Description	Example	Related UX entity
Value <sup>O</sup> (H)	These words represent final or behavioural values.	Ambitious, open-minded	User's personal characteristics
Semantic descriptor <sup>C</sup> (H)	Adjectives related to the meaning and characteristics.	Playful, romantic, traditional	User's perceived kansei quality
Emotion <sup>N</sup> (H)	Targeted emotion to be felt by the user	Joy, surprise, interest	User's perceived kansei quality
Style <sup>O</sup> (H)	Characterization of all levels together through a specific style.	Edge design	Product attributes
Lifestyle <sup>N</sup> (M)	Combination of values of the user	Work hard and play hard	User's personal characteristics
Interface characteristic <sup>E</sup> (M)	Underlying logics, engagement required	Mental engagement, physical and direct interface	Interaction attributes
Action enabled <sup>E</sup> (M)	Function, usage	Create, relax, communicate	Interaction attributes
Product characteristic <sup>E</sup> (M)	Components, ways of functioning, spatial organisation	Mechanical handle, roominess	Product attributes
Sector/object <sup>O</sup> (M)	Object or sector being representative for expressing a particular trend	Tennis, wearable computing	Product attributes
Physical context <sup>X</sup> (M)	Physical elements surrounding the product	In a modern living room	Context attributes
Temporal context <sup>X</sup> (M)	Notion of time in the interaction	Narrative description on an interaction	Context attributes
Culture <sup>N</sup> (L)	The culture of a user covers his/her age, gender, nationality, function, and organisational affiliation.	Young (20-29) Europeans	User's personal characteristics
Morphology <sup>N</sup> (L)	Related to the outward appearance of the user	Body shape, structure, handicap	User's personal characteristics
Gesture <sup>E</sup> (L)	Movement of a part of the user's body used as input	Hand and body movements	Interaction attributes

Feedback <sup>E</sup> (L)	Communication to the users that is influenced by prior inputs	Blinking light and sound	Interaction attributes
Visual attribute <sup>C</sup> (L)	Overall shape or component, shape size, and chromatic properties	Square, long and thin, Light blue, Pantone 17-5641 Emerald	Product attributes
Tactile attribute <sup>X</sup> (L)	Material, temperature, texture	Plastic, stripped surface, rough	Product attributes
Auditory attribute <sup>N</sup> (L)	Rhythm, timber, etc.	Irregular, high pitch	Product attributes
Olfactory attribute <sup>N</sup> (L)	Scent families and facets	Citrus, woody, floral	Product attributes

(H): High level of abstraction

(M): Middle level of abstraction

(L): Low level of abstraction

<sup>O</sup>: Category originally presented by Kim et al. (2009)

<sup>E</sup>: Extracted from an original category

<sup>C</sup>: Combination of original categories

<sup>X</sup>: Extension of an original category

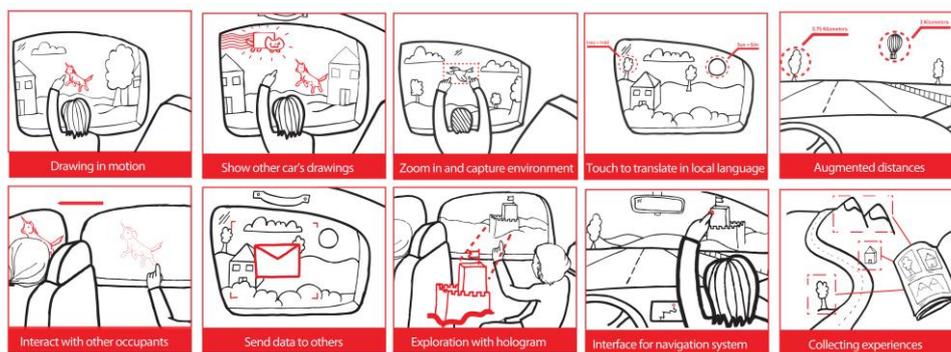
<sup>N</sup>: New category

## 5. ANALYSIS

In this section, the results of the analysis of each typology of design-driven NCD projects will be presented one by one. The results focus on the context of the projects (purpose, design team, audience), and on the design information conveyed by their output representations. The results will then be discussed together in section 6.

### 5.1. Exploratory concept (EC) projects

Eleven of the 27 projects analysed were described as “exploratory concept” projects. These include, for instance, the “Window to the world” project, which proposed to tackle the interaction between car occupants and their environment in a poetic and seamless way. An output of this project can be found on Figure 3. More information, such as a video and prototype pictures, can also be found on the Internet (<http://bit.ly/15sb6A3> and <http://bit.ly/114Gwhq>).



**Figure 3:** Window to the world project – a TME-KD & CIID collaboration

#### 5.1.1. Context of the projects

The outputs of EC projects were concepts offering new experiences of mobility. Their focus was on mobility itself or on the interactions between a human and the environment (including other humans) supported by a mobility device. They can be regarded as NCD projects providing experience design-driven outputs for future *breakthrough products*. For all of these projects, the design team involved were rather small (around 5 persons) and varied a lot from one project to

another. They were always multi-cultural (multi-nationality, multi-gender, multi-function). The functions covered included design, business, and engineering, as well as complementary functions such as social sciences and computing. Most of the projects (73%) involved design team members external to TME. These external members were affiliated with organisation such as consultancy firms or universities. For every project analysed, part of the final audience was unknown at the start. The audience finally reached was nevertheless much wider than that of the other types of projects. It depended on the topic tackled but also on the advice and recommendations received during the communication process. The audience was generally high up in the organisational scale.

### 5.1.2. Design information conveyed

The main design information categories conveyed by final outputs of “exploratory concept” projects are presented in Table 2. The table organises categories according to their abstraction level (vertically) and the experience entity to which they refer (horizontally). As shown in this table, it appears that the kansei representations created mostly cover abstract design information. Most of the categories corresponding to high and middle levels of abstraction are covered (all except *style* and *product characteristics*). Notably, no concrete design information categories related to the product to be designed are covered. The narrative and interactive outputs relied on concrete elements in order to communicate the experience intention, but these characteristics did not belong to the main design information that were intended to be communicated.

**Table 2:** Categories of design information conveyed by EC project outputs

Abstraction level	User’s personal characteristics	User’s perceived kansei qualities	Interaction attributes	Product and context attributes
High	- Value	- Semantic word - Emotion		
Middle	- Lifestyle		- Interface characteristic - Action enabled	- Sector/object - Physical context - Temporal context
Low	- Culture		- Gesture <sup>EM</sup> - Feedback <sup>EM</sup>	

<sup>EM</sup>: Emerging category

## 5.2. Product lining strategy (PLS) projects

Ten of the 27 projects analysed fit in the “product lining strategy” project type. These projects include, for instance, the methodologies and outputs such as those presented by the authors in other publications (Gentner, Bouchard, Esquivel, & Favart, 2013).

### 5.2.1. Context of the projects

“Product lining strategy” projects are meant to impact specific upcoming *platform product* development projects (e.g., hybrid vehicle NPD projects). Their outputs were meant to be used by upcoming NPD teams (internal or supplier R&D teams). The audience was composed of both managerial (for EC projects) and working-level Toyota employees. Therefore, the interviewees expressed the importance of having the experience directions and strategies conveying information that could be used directly by engineering, business, and design departments. Compared to EC projects, the profiles of the multi-cultural design teams were much more structured. Only product planners, designers, and engineers were involved in PLS projects. They also involved fewer members affiliated with external organisations (30% and only as support).

### 5.2.2. Design information conveyed

The main design information categories conveyed by the kansei representations resulting from PLS projects are presented in Table 3. The scope of information covered is wide. All experience entities except the context are covered with low to high abstraction categories (when a category exists). The kansei representations contained information to guide and inspire styling (e.g., *semantic word, emotion, style, visual attribute, tactile attribute, and other sensory attributes*) and interaction design activities (e.g., *semantic word, emotion, gesture, feedback*). They could also be used by product planners interested in information about markets (e.g., *value, culture*) and product package (e.g., *sector/object*), as well as by engineers working on topics such as material developments (e.g., *emotion, semantic, style, visual, and tactile*). Notably, many categories of design information are currently emerging in PLS projects (noted as EM in Table 3).

**Table 3:** Categories of design information conveyed by PLS project outputs

Abstraction level	User's personal characteristics	User's perceived kansei qualities	Interaction attributes	Product and context attributes
High	- Value <sup>EM</sup>	- Semantic word - Emotion		- Style
Middle			- Action enabled <sup>EM</sup>	- Sector/object - Product characteristic <sup>EM</sup>
Low	- Culture - Morphology <sup>EM</sup>		- Gesture <sup>EM</sup> - Feedback <sup>EM</sup>	- Visual attribute - Tactile attribute - Auditory attribute - Olfactory attribute <sup>EM</sup>

<sup>EM</sup>: Emerging category

### 5.3. Pre-development direction (PDD) projects

Six projects could be described as PDD projects. They will be described in terms of context and design information conveyed.

#### 5.3.1. Context of the projects

The UX-related design information that these projects provide was preparing upcoming NPD projects (short-term). The kansei representations were aimed at a very specific audience, such as styling designers (e.g., for wheel development) or material engineers (e.g., for material development). The audience covered both managerial and working-level employees. These representations expressed directions and strategies focused on the kansei qualities that could be expressed by different grade variations of a future vehicle updates. Fifty percent of the projects used kansei cards, a visual tool facilitating kansei-related discussions (Gentner, Bouchard, Badoil, & Favart, 2014).

The particularity of "pre-development direction" projects is that they were directly related to a new *incremental product* development project (NPD). Similar to the other typologies of projects, the design teams involved were multi-cultural. In the teams' composition, a stronger accent was usually put on the function that would later be the most involved in the NPD projects (e.g., more styling designers were involved when preparing styling oriented projects). Notably, this typology of projects only involved members working at TME.

#### 5.3.2. Design information conveyed

The main design information categories conveyed by the kansei representations resulting from PDD projects are presented in Table 4. It can be observed that whereas all product attributes are covered, no design information categories related to interaction attributes are tackled. This can be

put in perspective with the fact that the original role of TME-KD was related to sensory quality perception. The experience resulting from static perception appears to remain the domain of activity of the division the most established for the projects that are the closest to the NPD phase.

**Table 4:** Categories of design information conveyed by PDD project outputs

Abstraction level	User's personal characteristics	User's perceived kansei qualities	Interaction attributes	Product and context attributes
High	- Value	- Semantic word - Emotion		- Style
Middle	- Lifestyle <sup>EM</sup>			- Sector/object - Product characteristic
Low	- Culture			- Visual - Tactile attribute

<sup>EM</sup>: Emerging category

## 6. DISCUSSION

The three typologies of projects will now be discussed together. Table 5 summarises this discussion.

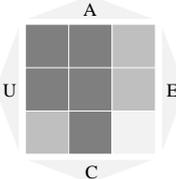
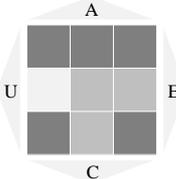
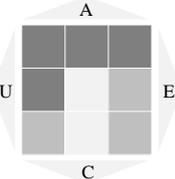
### 6.1. Context of the projects

By construction, the purposes of the three types of projects are different (this is the definition of EC, PLS, and PDD projects). Similarities could nevertheless be observed regarding the nature of the design teams involved. It appeared that they were all composed of a similar number of members. Five seemed to be the average number, regardless of the project type. The different design teams also had in common the fact that they were multi-cultural. Functions traditionally less related to the industrial context (e.g., human sciences, computing) could only be found in EC projects. The involvement of people outside the company in the design team was the highest for projects related to long-term innovations (EC projects). Their involvement decreased progressively for PLS and PDD projects (when the commercialisation date becomes more and more clear). Differences could also be observed regarding the audience of the projects. Whereas EC projects mainly targeted managers dealing with vision and strategies, PLS and PDD projects' audiences covered both managerial and working-level employees. These two typologies of projects were indeed meant to increase reciprocal understandings of UX topics among upcoming NPD projects teams and their stakeholders.

### 6.2. Design information conveyed

The kansei representations resulting from the different types of projects had in common the fact that they effectively covered abstract design information categories and that they related these categories to design information categories with a lower level of abstraction. All the types of projects expressed an intention regarding kansei qualities (emotion, semantic descriptor). They also referred the abstract design information related to the potential user (*value*) and to the product to be designed (*style*). Outputs from EC projects were nevertheless the only ones to convey design information related to all five UX entities and sub-entities. PLS and PDD projects lacked information about intentional contexts of use (temporal, physical), and PLS projects did not convey any intention related to interaction attributes.

**Table 5:** Summary of the experimentation

		<b>Exploratory concept</b>	<b>Product lining strategy</b>	<b>Pre-development direction</b>
<b>Context of the projects</b>	<i>Purpose</i>	Propose new experience concepts for future <i>breakthrough products</i>	Identify user experience logics and directions for future <i>platform products</i>	Prepare grade and character strategies of future <i>incremental products</i>
	<i>Design team</i>	- Multi-cultural - Members from inside and outside the company	- Multi-cultural - Mostly members from inside the company	- Multi-cultural - Only members from inside the company
	<i>Audience</i>	- Wide but fuzzy - Mostly management level	- Specific - Management and working levels	- Very specific (development team) - Management and working levels
<b>Design information conveyed</b>	<i>High level</i>	PC: Value KQ: Semantic descriptor, emotion	PC: Value KQ: Semantic descriptor, emotion PA: Style	PC: Value KQ: Semantic descriptor, emotion PA: Style
	<i>Middle level</i>	PC: Lifestyle IA: Interface characteristic, action enabled PA: Sector/object  CA: Physical context, temporal context	IA: Action enabled  PA: Sector/object, product characteristic	PC: Lifestyle  PA: Sector/object, product characteristic
	<i>Low level</i>	PC: Culture IA: Gesture, feedback	PC: Culture, morphology IA: Gesture, feedback PA: Visual, tactile, auditory, olfactory att.	PC: Culture PA: Visual, tactile att.
	<i>Summary</i>			

*Design information conveyed*

PC: Personal characteristics      A: Abstract  
 KQ: Kansei qualities                C: Concrete  
 IA: Interaction attributes          U: User  
 PA: Product attributes              E: Environment  
 CA: Context attributes

For EC projects, the design information related to the product to be designed remained abstract. On the contrary, this type of design information was very present for PLS and PDD projects. This is indeed the experience entity that appeared to be most directly impacted by the NPD projects that followed. This might be because it is where new meanings and experiences are traditionally created in the automotive industry (e.g., interior layout, materials, features).

EC projects and, increasingly, PLS projects conveyed design information related to interaction attributes. They covered categories such as *gesture*, *feedback*, *interface characteristic*, and *action enabled* (*action enabled* only for EC). The reasons for this were nevertheless different. On the one hand, EC projects proposed concepts with radically new UX (in the sense of Verganti, 2009) that included new interaction propositions, and on the other hand PLS projects increasingly sought to investigate the influence that different interfaces (e.g., button vs. touchscreen) have on the

perceived kansei qualities in conventional vehicle environments. In the latter case, the interaction-related design information enriched the recommendations provided by the resulting kansei representations.

As highlighted previously, the outputs of PLS and PDD projects did not express any specific intentions related to the contexts of the intended experiences. One reason for this is that the temporal and physical contexts of new *platform* and *incremental products* resemble that of current vehicles. This aspect is therefore not the centre of attention of these project typologies.

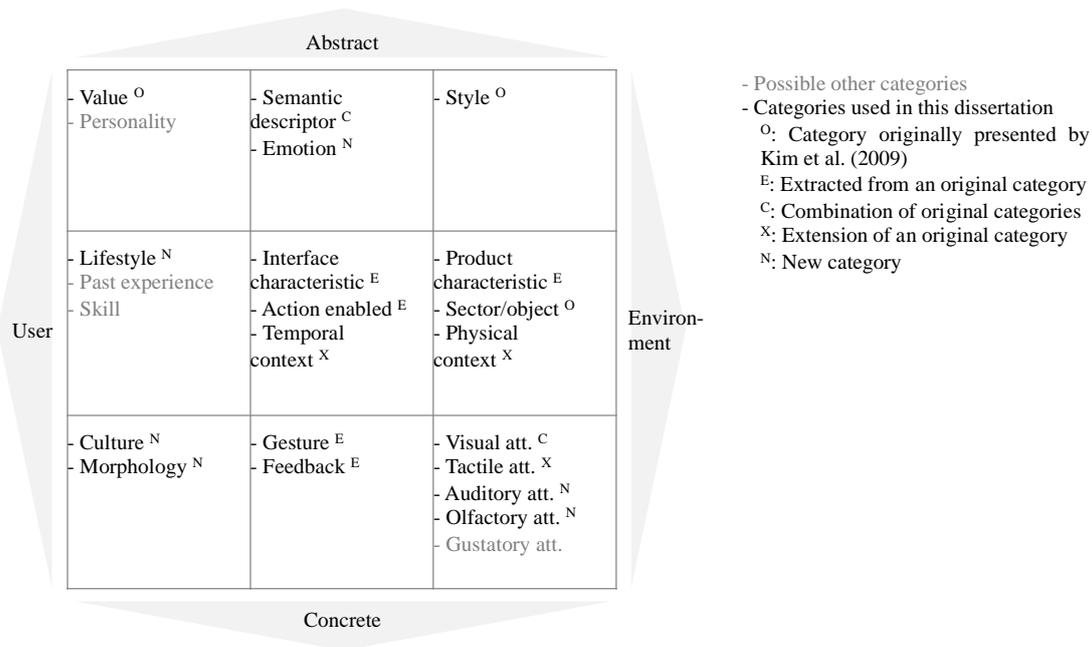
In Table 5, the summary figures related to the design information section give an overview of the typical categories covered by each typology of project. The darkness of the box is proportional to the precision with which the area is covered. The vertical axis corresponds to the abstraction level (low, middle, high). The anchors of the horizontal axis are labelled “user” and “environment.” The left column corresponds therefore to design information describing the targeted user (i.e., personal characteristics) and the right column to design information describing static aspects of the environment (i.e., intentional product attributes, physical context). Finally, the centre column corresponds to the information related to the intended user-product interaction (i.e., kansei qualities, interaction attributes, temporal context). The related categories neither describe to the targeted user, nor the intended product and environment of use.

## 7. CONCLUSION

In this experimentation, 27 industrial NCD projects conveying an intention in terms of user experience were analysed. Their outputs can be referred to as kansei representations as they link intended kansei qualities with personal characteristics of targeted users and attributes of the environment of design. The three types of projects identified (“exploratory concept,” “product lining strategy,” “pre-development direction”) were described and compared in terms of context and design information categories conveyed by their outputs.

This experimentation enabled us to validate our hypothesis (H - The design information exchanged during early design activities depends on the typology of the project in which these activities take place). Indeed, it appeared that the design information exchanged during early concept creation phases is very dependent on the type of project in which the concept creation phase occurs. Although this experimentation covered 27 industrial design projects, one limitation that can be identified is that these projects were all related to the same organisation (TME-KD). Additionally, further activities should also be conducted in order to better relate the design information conveyed with the design methodologies and with the nature of the early representations used as a means of communication (e.g., visual, multi-sensory, narrative).

A model of kansei-related design information has been created in order to better picture the contributions of this experimentation and to facilitate future researches of the subject. The model, which is presented in Figure 4, keeps the structure of the figures used in Table 5 in order to summarise the design information conveyed by the three identified typologies of design-driven projects. The design information categories in Table 1 are presented according to two dimensions (two axes) representative of their level of abstraction (vertical axis) and of the experience entity to which they are referring (horizontal axis). In that sense, the model shows a representation of the experience originating from a human-product interaction (see “kansei-experience framework” in Figure 1) from the perspective of the design information exchanged during concept creation activities.



**Figure 4:** Model of kansei-related design information

Besides describing the design information exchanged within a design team, the model also facilitates comparisons and discussions related to our research question (*What are the design information categories that kansei-focused activities can cover in the early concept creation phase?*). The summary figures displayed in Table 4 are a good example of this additional function of the model.

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## BIOGRAPHY

**Alexandre Gentner** recently defended his PhD research focusing on the definition and representation of user experience intentions in the early phases of the industrial design process. This action research was made possible because of a long-lasting collaboration between Arts&Métiers ParisTech (university) and Toyota Motor Europe (industrial partner). In this research, he explored the bridges existing between user experience and kansei research and the way these aspects can be addressed in early design activities. Some of the industrial contributions of this research were the creation of tools and methodologies supporting the reciprocal understanding of design information-rich representations of user experience directions.

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