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Sense-making in Cross-channel Design

Abstract

Successful cross-channel user experiences rely upon a strong informational layer that creates understanding amongst users of a service. This pervasive information layer helps users form conceptual models about how the overall experience works (irrespective of the channel in which they reside). This paper explores the early development of a practical framework for the creation of meaningful cross-channel information architectures or "architectures of meaning". We explore the strategic roles that individual channels can play as well as the different factors that can degrade a userâ€˜s understanding within a cross-channel user experience.

Why Now?

The pace and delivery of ubiquitous computing, whilst increasing year on year, has (in our opinion) yet to result in significant, commercially successful pervasive technologies within the home, office or wider world. However within commercial digital user experience (Hassenzahl 2013) design teams, the last 5 years have seen the explosion of service delivery across four common channels: web, mobile, tablet, physical space (e.g. retail outlets). One obvious reason for this explosion in cross-channel service delivery is the continuing development and success of the smart phone.

One industry that could potentially be revolutionized through effective cross-channel design is retail. Greg Satall (2012) on the Innovation Excellence blog highlights the "slow crawl of e-commerce" over the last 15 years. Satall points out that although some estimates of e-commerce (as a percentage of total retail) are as high as %, shopping is still primarily an activity conducted in the physical and not digital world.

Satall goes on to emphasise that the important distinction is no longer to think in terms of e-commerce vs. retail but how different digital technologies and channels can be used to support the wider shopping experience as a whole. With the number of channels that services can be delivered by set to grow in the future, there is an urgent need to identify methods by which successful cross-channel user experiences (Resmini & Rosati 2011) can be

designed.

This paper intends to explore the concept that successful cross-channel user experiences rely upon a strong information layer (Institute for the Future 2009) that creates understanding and meaning amongst users of a service. It builds upon the acknowledgement that this informational layer is both pervasive and reliant upon a conceptual model that a user of a service creates in their mind (Satall 2012). Therefore, a success criterion of a cross-channel service can be whether the service's information architecture can create an architecture of meaning or understanding within the minds of its users, irrespective of which channel they engage with (or previously engaged with in the past). In essence, upon entry to the cross-channel experience the user must find the design of the system a help in formulating the correct conceptual model in order to proceed.

Therefore, it is our contention that if we are to begin to create architectures of meaning within complex cross-channel systems, we must first begin to understand the relationship that each channel will play and the many ways that a user's understanding can degrade within the system. It is proposed that by answering these two core questions early in a design process we will be in a position to begin to architect true understanding in our cross-channel experiences. In the paper, we describe three core phases:

1. an initial literature review of existing research and theories of information architecture, information foraging, psychology and cross-channel design;

2. a broader discussion on the development of these theories into the beginnings of a practical framework — in particular, exploring the reasons for failure in cross-channel tasks;

3. a small pilot study on a major UK retailer to further explore and develop our initial ideas further.

Our aim with this paper is to begin a conversation around how cross-channel information architectures form the basis of engaging and meaningful cross-channel user experiences. The paper proposes a number of key considerations in the creation of these cross-channel information architectures. We conclude by outlining a stepped approach and a number of design heuristics that can be used to move towards the practical development of successful architectures of meaning.

Information Architecture as the "Sense-making Glue"

Resmini and Rosati (2011) provided a broad discussion on the evolution of information architecture in Pervasive Information Architecture: Designing Cross Channel User Experiences.

Resmini and Rosati argued that information architecture can play an invaluable role in the creation of successful cross-channel design. It is through the development of a consistent, meaningful information layer (Institute for the Future 2009) that the success of cross-channel service delivery can be designed and maintained. The authors defined five core heuristics to be considered in the development of cross-channel information architectures: place making, consistency, resilience, reduction and correlation. Of these five heuristics, Resmini and Rosati argued that:

> *Correlation creates cross-channel continuity and design. Continuity creates paths and possibilities therefore creates shared meaning*
>
> *Correlation relates to the capability of pervasive information architecture to convey pieces of information, services and goods to help users achieve explicit goals or stimulate latent needs*

In particular, Resmini and Rosati identified two types of correlation important to cross-channel information architectures: internal and external correlation. Internal correlation relates to the semantic proximity of items within the same channel. In contrast (and most importantly for cross-channel information architecture), external correlation promotes:

> *The semantic proximity between items belonging to different channels but connected to the same task, process or people*

Resmini and Rosati concluded:

> *We can clearly see that in the design of cross-channel user experience, information architecture is the diffuse pervasive layer that holds all the pieces together*

When viewed in this light, it can be seen that a cross-channel user experience is only as strong as its weakest channel. Any channel that is the "weak informational link" in the "service delivery chain" can result in reduced understanding and ultimately task failure. In essence, Resmini and Rosati were describing information architecture as the glue which can be used to hold together cross-channel user experiences.

The concept of information architecture acting as the "sense making glue" in cross-channel user experiences is further supported by the work of Pirolli (2007). Pirolli has developed Information Foraging Theory (IFT) as a as a means of exploring how people search for information in our modern, information rich digital environments.

IFT aims to best explain and predict how people will best shape themselves for their information environments and how information environments can be best shaped for people.

IFT is based upon Optimal Foraging Theory (from the biological sciences) of how animals forage for food in different environments. This theory has been validated as a useful approximation to human information foraging behaviour. In relation to information foraging, Pirolli describes the key concept of how a forager's task environment is directly affected by his / her information environment. It is Pirolli's definition of task and information environments that supports the ascertion of Resmini and Rosati that a strong information layer is the key to cross-channel success:

- task environments: An environment coupled with a goal, problem or task. Boundaries are clearly defined.
- information environments: Tributary knowledge that permits people to more adaptively engage their task environments.

It is proposed that Pirolli's work on IFT (which is largly based on within website navigation) is directly attributable in a cross-channel context. At a more macro level, the Task Environment could be perceived as individual channels with which people engage, whilst the Information Environment continues to act as a facilitator for driving that engagement.

If we consider individual task environments as individual channels then a major challenge of cross-channel design is that we are constantly changing the task environment! If our information environment is not well defined then meaning can break down with each channel transition (for example moving from a desktop website to a mobile app), ultimately resulting in a poor cross-channel user experience.

The identification of information environments acting as a layer that enhances user performance within a given task environment resonates strongly with Resmini and Rosati's assertion that information architecture can be used as the binding pervasive layer for cross-channel user experiences.

Easing our Cognitive Load

We have discussed how the design of a cross-channel information architecture can support or hinder our transitions between channels. One effect of a poorly constucted information architecture is to cause us a greater level of cognitive load upon transitioning and entering a given channel (Cooper 2004). The greater our cognitive load then the greater liklihood of perceived (or actual!) complexity.Given the limitations of our cognitive systems (especially our memory) it is imperative that people are supported. Swapping from one device to another whether it is a smartphone, tablet or the desktop can present considerable challenges and increase the cognitive load and therefore increase the cognitive friction (Cooper 2004) of the experience, which in turn can have a massive sway on whether we continue or abandon.

In accordance with Resmini and Rosati, we propose that the user interface for each channel needs to support its typical usage and a single and consistent information architecture needs to be presented between devices and channels to ease the cognitive load of users.

We are not suggesting a "mobile first" (Wroblewski 2011) type approach but rather a meaning first approach. Through understanding what is meaningful and pertinent to a user at entry to any channel we can provide people with a consistent and meaningful interaction experience across every device and channel that supports their limited cognitive faculty (therefore creating cross-channel experiences that feel more engaging and consistent).

It is proposed that through the provision of "familiar" user interfaces that are based on established interaction design patterns we can potentially flatten the learning curve that exists for people as they switch between devices and channels. Therefore, lowering the learning threshold will lead to increased cross-channel engagement.

The smoother and more familiar an interaction feels, the greater the fit with our actual behavioural usage of the device. If people can move between devices and channels more quickly and intuitively the quality of the overall experience is increased.

In short, we believe that a user is constantly engaging with a single complex system in order to achieve their goals. Whilst it is acknowledged that the design of each individual channel is also paramount, if a user cannot see the relationships between channels then their experience will suffer.

Therefore, consistency in the presentation of the information architecture between devices and channels is critical. The greater the consistency, the greater the familiarisation and the lower the cognitive load which in turn, will support easier movement between devices and channels.

When channels provide meaningful interfaces that support the continuation of a cross-channel experience, people naturally abandon the channel either because they have successful completed the task they wanted to complete or they leave but plan to return.

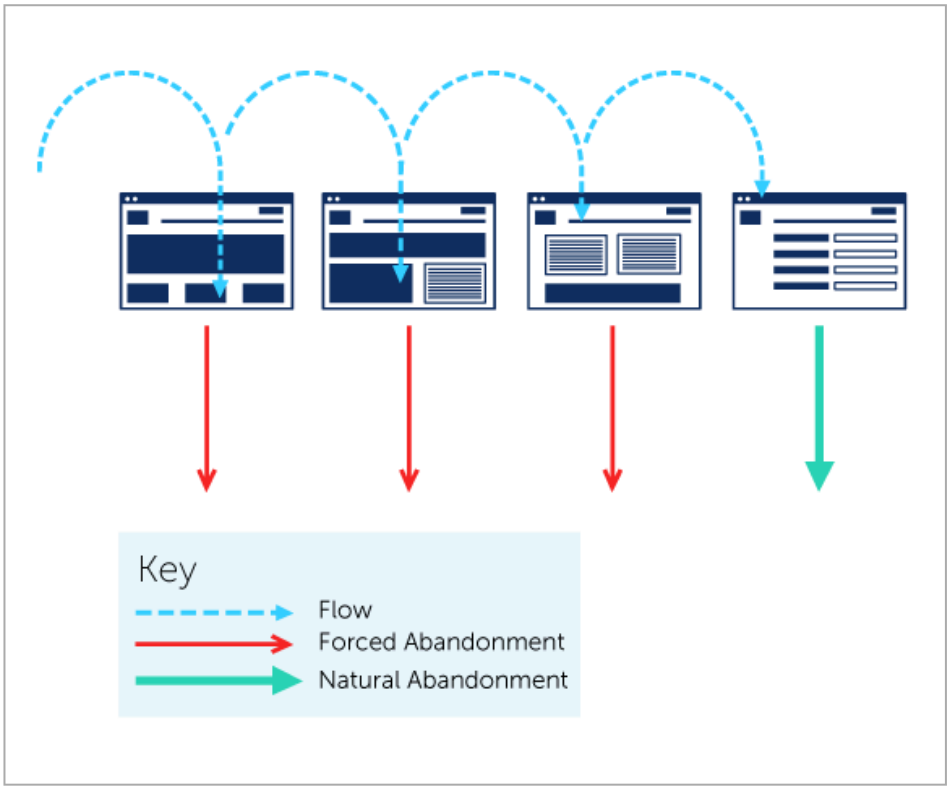

Figure 1. As users move through and across channels interfaces should encourage the creation of "flow" leading to a natural abandonment of the channel.

The often cited "optimal flow" (Csikszentmihalyi 1990) that we feel when our interactions just work and feel meaningful is a result of people becoming more invested in an experience that increases their engagement and allows them to abandon naturally. Their perception and actual cognitive load is perceived as low.

To put it another way we strive for control and maintaining control is a fundamental human need. When control is lost or more specifically removed our anxiety becomes heightened. Our need to regain control will take-up

more of our conscious focus thus increasing our cognitive load and if this means we abandon an experience we will - our patience is finite!

In this paper we propose that when an experience supports cross-channel switching, both the perceived and actual cognitive load of the user will be low. This will generate a feeling of accomplishment because usersâ€˜ will be having a positive experience and in turn their perception of the organisation behind the experience is also enhanced.

Appropriate Channels? — Telic vs. Paratelic Behaviour

In addition to reducing a persons cognitive load, another key factor to consider is the appropriateness of a channel for performing particular goals.

Web browsing and completing a web task are two different things. Web browsing is a common behaviour that does not have to be task specific. For example, it is common for people to be browsing the web on their mobile whilst watching television. In so doing they may regularly switch between a very structured goal (for example, finding the name of the actor in the movie they're watching) and a very unstructured goal (for example browsing and looking for ideas for their next family holiday).

Typically in cross-channel experiences, people don't remain in either a structured or unstructured goal state but are constantly moving between them. In essence, throughout our lives we are often in a state of flux between thoughtful or spontaneous! When considering the design of meaningful cross-channel experiences it is not the duration we spend in any one state that is the important acknowledgement but the fact that we regularly switch back and forth.

Reversal Theory proposed by Michael Apter (1998) provides an emotional model which can be used to frame behaviour, specifically our meta-motivations. Apter outlined four domains in the theory and the one that interests us is the means-end domain where people reverse between a paratelic and telic state.

Apter defines goal and task orientated behaviour as telic in nature whereas non-goal or non-task behaviour is paratelic. When we are browsing we are in a paratelic state whereas when completing a task we are in a telic state.

Where reversal theory proves interesting to the design of cross-channel information architectures is the way that smaller screen sizes prioritise the

need to present task focused, telic behavior driven service offerings. The smaller the screen size the greater the need for performance and the greater focusing of the design to be task-specific. Does this mean that smaller devices with smaller screen resolutions should provide more telic activity?

This is a considerable design challenge because human beings do not naturally remain in one state (especially a telic state which requires greater cognitive resources — see above) and therefore screen real estate could be artificially responsible for task abandonment and device (experience) rejection.

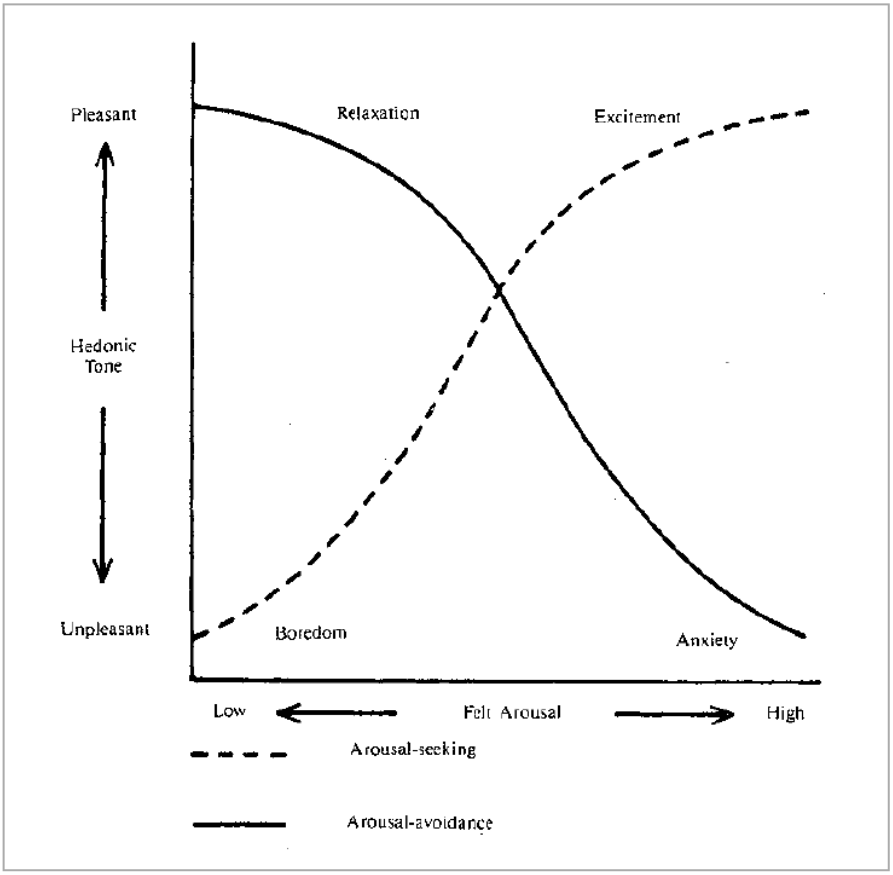

Figure 2

For example, imagine trying to browse (a paratelic behavior) a website that has not been optimized for mobile experience. Our state would naturally start to revert to a telic state ("task focused") because of the greater cognitive demands of the complex task. Apter would conclude that this "forced" transition from a paratelic state to a telic one could naturally induce anxiety, and therefore potential channel abandonment.

What reversal theory shows us that unless we are prepared to optimise the small devices in our cross chennel systems, then we can expect a higher liklihood of forced abandonment from these channels. We can all agree that it is much easier to read an article on a smartphone when the website you are viewing is responsive and text size is appropriate.

Providing a consistent and meaningful channel experience requires an understanding of not only the opportunities but the limitations of every device that is part of the cross-channel experience in terms of behaviour and usage.Some devices may be better set up for telic rather than paratelic behaviour. It is important that we identify this level of appropriateness early in our design processes.

General Commentary

The work of both Pirolli and Resmini and Rosati indicates that information architecture has the ability to hold together successful cross-channel experiences. It is the informational design of a cross-channel service that will ultimately contribute the greatest sense of meaning. It is also proposed that the psychological principle of cognitive load and the work of Apter could also be critical in the potential abandonment and failure of cross-channel experiences.

The results of the literature review raises two very important questions:

1. how do we define the informational role that each channel is playing in the wider service / user experience being designed?

2. what factors affect the degradation of understanding across a cross-channel experience?

Defining a Channel's Role in the Ecosystem

There are limitless types of cross-channel journeys that can be designed today and it is not the intention of this paper to dissect and discuss them. However, it is believed that understanding the broader types of cross-channel experience that can be designed can ultimately be beneficial in the creation of any given cross-channel information architecture and therefore provide a better, authentic and engaging experience.

Newell & Simon (1972) characterised problem solving formally as a process of search through a problem space. A problem space consists of an initial

situation, the desired situation (the goal state that we are trying to achieve) and any number of intermediary situations that enable us to travel from the initial to the desired situation.

Of benefit to the question of cross-channel information architecture design, is Newell & Simon's definition of well-structured vs. ill structured problem spaces. A well-structured problem space could be considered to be a closed loop with all the rules of the system clearly outlined and visible to a user. For example, two chess players are operating in a clearly defined problem space where all rules and search behaviour is operating within the single channel of the 64 squares on the board.

However, Newell & Simon clearly identified that many "everyday problems" are operating in ill-structured problem spaces where the rules and guides are not visible or clear. For example, "I want to buy a house", "I want to go for dinner on Friday night" or "Which new laptop will meet all of my work and travel needs?"

It is easy to see and acknowledge that a major problem facing cross-channel information architecture design is the fact that the majority of problem spaces are ill-structured from the view point of the end user.

We have previously discussed that a user is essentially dealing with one complex system rather than the individual channel they may find themselves in currently. The very nature of ill-structured problem spaces (for example, "Where shall I go on holiday?") means that there is a higher liklihood that we will solve thse problems over time , and thus most likely in a cross-channel context. Therefore, it is proposed that there is benefit to be gained from defining the informational requirements of our ill-structured cross-channel experiences early in our design processes.

With this in approach in mind, Anderson (1990) outlined a process for the design of information processing mechanisms:

1. Specify precisely the goals of agent
2. Develop formal model of the environment to which agent is adapted
3. Make minimal assumptions about computational cost
4. Derive optimal behaviour
5. Test

6. Iterate

If we replace "agent" with "channel" in step 1, we can see that specifying the goal each channel will play in the wider experience being designed will enable us to begin to logically structure our cross-channel information architecture.

Some cross-channel experiences operate as seamless jumps between channels. For example, I am shopping in a retail store, I see the URL for a promotion (or QR code), I Google it on my smart phone and enter the promotional code. All of these tasks happen in series and are immediate. The entire process lasting less than a minute.

Other cross-channel experiences can be spread out across a much wider timescale and in the eyes of the user on individual channels ("The customer is interacting with the brand (...) they don't care about the channel" in McMullin & Starmer 2010). For example, when making an important, expensive purchase, a user may complete multiple visits to a company across web, mobile, tablet and retail channels. McMullin & Starmer (2010) found that 53% of US adults bought offline after researching online. In our own experience, for large scale expensive purchases many users have been shown to take as much as three months to decide to purchase from a retail store after gathering information through various digital channels.

Pirolli identified that three times as many online users report seeking multiple pieces of information in response to a goal compared to seeking a single piece of information to satisfy a goal. In essence, the majority of web users seek lots of pieces of information before making a decision. Putting this finding in the context of designing cross-channel experiences, then designers must acknowledge that the context of the end goal itself has to play an important part in the way we define each channel prior to the commencement of our cross-channel information architectures.

Based upon the recognition that the majority of cross-channel experiences are ill structured problem spaces (Newell & Simon 1972), we should define the goals of channels first (Anderson 1990) and user goals can vary in terms of time and purpose, we initially propose the following four classifications for channels:

Support Channel: The channel is a key stepping stone in the user's task flow and supports a wider goal that transitions across the wider cross-channel user experience. The channel itself does not fulfill a dedicated individual service but helps a user complete (or move towards completion) of their wider goals. For example, the promotional URL or QR code that redirects a user to the

promotional mobile site. The online dating app (name) whose sole purpose is to vibrate a user's phone in their pocket that shows someone else is in the same room who matches their profile (the user having defined their online dating preferences on the desktop website of the service and the wider goal being to be introduced to a potential partner). It is the authors' proposal that many ubiquitous computing products could fall into the category of support channel. Kuniavsky's (2010) discussion on Service Avatars provides excellent thoughts on this proposal.

Replication Channel: The channel acts as a replication of an existing service on other channels within the wider user experience. The channel may mirror all or some service and support mechanisms provided on other channels and its use could be considered context specific. For example, many online retail sites would have an equivalent mobile site. The mobile site is effectively replicating the user need to browse, bookmark and purchase items. A replication channel can typically be thought of as fulfilling more longitudinal goals such as researching purchase decisions.

Multi-Purpose Channel: The channel must fulfill a number of roles across a number of user journeys. In some instances acting as a support channel and a replication channel (see above). For example, a mobile / tablet version of a retail website that enables users to browse through the organisations product range ("replication") whilst also providing mapping services and alerts to the nearest physical retail store ("support").

Symbiotic Channel: The channel is designed to be used at the same time as another channel. This type of channel could be considered a type of support channel but its parallel use in conjunction with another channel warrants it a distinction. A good example of a symbiotic channel would be a mobile phone app that enables the stock checking of items in a physical order catalogue.

The often cited model of iTunes (fig. 3) is a good example of clearly defined channel roles operating in a successful cross-channel architecture. Morville (2011) breaks down the major channels of iTunes into following roles: play, manage, acquire.

We intend to explore this initial classification system further and acknowledge that in its infancy, it may not cover all possible channel services. However, it is proposed so as to enable the reader to begin to framework the problem space prior to the commencement of cross-channel information architecture design. It is our intent to expand upon this classification as part of the wider discussion on "sense-making in cross-channel design"

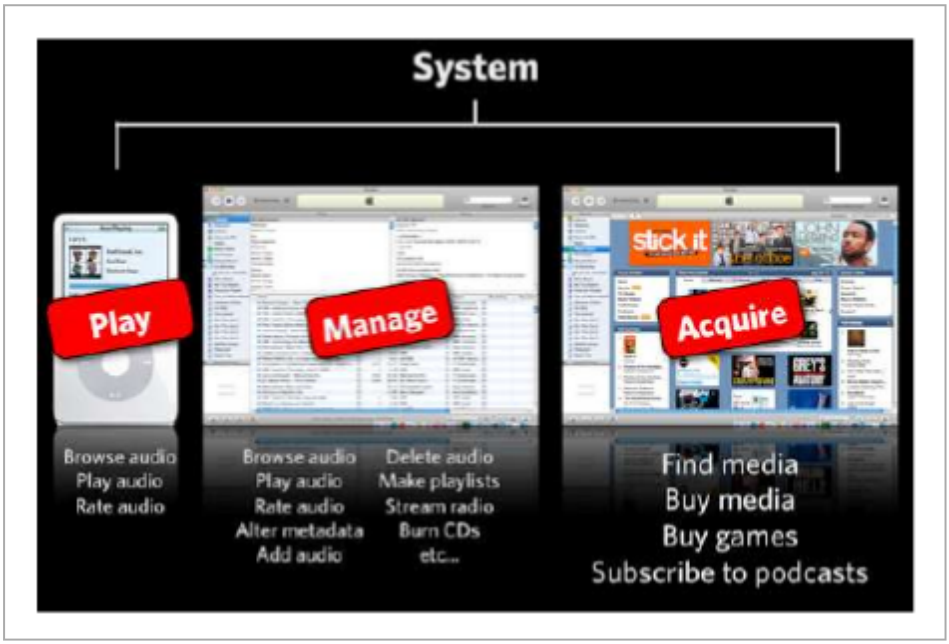

Figure 3

The Degradation of Meaning in a Cross-channel User Experience

The above classification system is intended to help us initially think about the potential strategic directions of each of the channels we might design for in a cross-channel user experience. By understanding the role of each potential channel we are in a much better position to identify the information needs of our users at key points in the experience being designed.

However, as well as understanding each channel's role in our experience design we must also attempt to understand how a user's understanding can degrade throughout it. It is proposed that by understanding the way understanding can degrade throughout a cross-channel information architecture, we will be in a better position to design meaningful experiences. To further guide our thinking as cross-channel user experience designers, Pirolli and IFT provide us with a valuable quotation to remember our design problem space:

Typically information foraging must be analysed as decision making under uncertainty

Earlier in this paper we introduced the work of Pirolli and IFT. IFT utilises the food foraging metaphor of optimal foraging theory (OFT) used in the

biological sciences. Within IFT, an information forager (the "informavore") will forage at a given "patch" (for example, a web page or web site) for as long as the cost of moving to another information patch is less than the cost of staying and looking for more meaningful information where they are.

The concept of "information patches" fits well within the context of cross-channel user experience design. In essence, each channel within our service can be viewed as a different informational patch that users can visit.

Essentially, an information forager is continually making the following evaluation decision as they browse a channel: "What is the likelihood that this channel can satisfy my informational needs?" This evaluation decision will be informed by a number of proximal cues (for example the links on a website) that a channel can give a user.

For example, upon first landing on a website the information a user is looking for may be three levels deep. From the home page, the user must make an immediate evaluation based upon what they can see (for example, the various labels in the main navigation) whether to continue to forage for information or to switch channel (or remain in the same channel but to visit a competitor's website instead).

Pirolli and Fu (2003) defined the act of using proximal cues to make an decision to continue foraging as the "information scent" of a given patch. They empirically demonstrated that difficulty of finding information on the web is directly linked to information scent. In conditions of high information scent, users move directly to their target information. In conditions of weak information scent, a more sporadic searching behaviour is witnessed with a greater amount of retraced steps. Nielsen (2003) and Spool, Perfetti & Brittan (2004) have also stressed used the importance of information scent within their well-established usability heuristics for navigating on the web.

Perhaps most alarming for the concept of degraded information scent and cross-channel service design is recent research by Gabriel Radvinsky (2011) at the University of Notre Dame. Radvinsky has recently completed research demonstrating that walking through doorways can result in complete memory lapses. For example, you walk into a room and completely forget why you went into that room or what you were looking for. This is something all readers will have experienced at some point in time.

Radvinsky has demonstrated that walking into another room can result in an "event boundary" which separates out the different activities and compartmentalizes them, storing them away in the brain and effectively wiping our short term working memory. Radvinsky's research, conducted

in both real and virtual environments with college students, showed that it is the actual act of walking through a doorway (both real or virtual) that can significantly impede memory retention of the task at hand. In essence, people's ability to retrieve information is diminished when the decisions and thoughts were made in another room!

Hotchkiss (2011) proposes that when navigating online we cross these "event boundaries" (or digital doorways? - authors' words) all the time. Hotchkiss goes on to suggest that Radvinsky's research suggests that our intent for moving to a different website can be lost if we are not actively focused on the task at hand and argues that our intent path must always be clear when moving between websites.

The findings of Radvinsky and the proposal of Hotchkiss further support our previous arguments that a major problem facing cross-channel information architecture design is the retention of information scent with each channel shift.

In defining their correlation heuristic, Resmini and Rosati identified two axes in a pervasive information architecture:

- vertical axis: representing hierarchical relationships between items in a collection;
- horizontal axis: representing similarity links between these same items.

Further still, Resmini and Rosati went on to describe a typical cross-channel business scenario as follows:

1. Start a task in any of the channels and seamlessly complete it in another one. For example place an order on the phone, receive updates via website and pick it up at the store.
2. Retrieve and exploit information acquired in channel A when we move to channelÂ B.
3. Experience unbroken flow along any channels or touch points by effectively making them communicating bridge artifacts.

In the authors' opinion, the above correlation description from Resmini and Rosati clearly resonates with the concept of information scent proposed in

IFT. In any cross-channel user experience it seems logical to attempt to maximise the information scent of a given goal across all channels. Indeed, in many instances it would seem to be the lack of strong information scent that is ultimately the cause of failure of a cross-channel user experience.

Pilot Study: Argos, UK

For the final part of this paper the authors reviewed and evaluated a cross-channel experience for a major UK retailer, Argos.

Argos is the largest general goods retailer in the UK, with over 800 stores in Britain and Ireland. Historically, Argos operates as a catalogue driven retailer but in 2012 it offers multiple channels including a website, a dedicated mobile website, a mobile app, the paper catalogue, and the physical retail store (featuring an electronic stock checker kiosk style interface).

To conduct our evaluations for the pilot study we chose a combination of methods consisting of heuristic evaluation (Nielsen 1994) and a service safari approach (Stickdorn & Schneider 2011). So that our observations and evaluations would have an end, we chose the activity of browsing, researching and purchasing a toy for a child less than 6 months old. The authors felt that this combination of "in the wild" observational techniques combined with expert evaluation would be a suitable combination for an initial pilot study of this size. All of the work in the pilot study was conducted by the authors.

We acknowledge that for an accurate empirical study, we would need to review multiple tasks across several retailers and service providers. However, the purpose of this pilot study was to enable us to compare and evaluate much of the literature and theory discussed earlier in this paper and to expand our framework for "sense-making" in cross-channel design. As with a lot of pilot studies, our intention was to develop ideas and methods rather than prove or disprove facts in a concrete way. What follows is a high-level review of our experience of research and purchase across the various Argos channels and the major issues and findings as a result of this exercise.

Inconsistency of Vertical Taxonomies

Of immediate consequence during the research were the discrepancies in the upper levels of the hierarchies of information across the channels. Looking at the top levels of the channel hierarchies we saw a number of differences in terms of the number of items and the nomenclature used. For example,

the website and mobile channels both contained 14 top level items in the vertical taxonomies whilst the mobile app contained 16, the paper catalogue had 12 and the in-store electronic checker contained 18. Interestingly several of these differences were observed to be around the children and toys categories.

An evaluation of the second and third levels of the various channel hierarchies again identified clear inconsistencies in terms of both numbers of items and nomenclature. For example, on the website the phrase "Pre-school toys" was used at the second level whilst within the app "Baby toys" was used. Searching the index at the back of the catalogue for the phrase "baby" rerouted the author to the jewelry section of the catalogue.

It is clear that these inconsistencies in the channel taxonomies can have a natural impact upon a user's ability to relocate information they may have previously located in another channel [1].

Inconsistencies in the channel taxonomies would directly impact the information scent of the desired goal and potentially frustrate a user even more than usual ("I know I found it before!").

Differences in Numbers of Paths Available Through Channels

A second key theme that arose from our evaluation of the Argos cross-channel experience was the differences in the number of navigational paths available to a user in the different channels. Starting with the desktop experience a user could locate their desired item through a number of different navigational paths on the website:

1. Through the main navigation;
2. Through the main site search
3. Through social recommendations from friends [2].
4. Through the sales area of the website
5. Through "Kids world" —a dedicated microsite for toys and games (naturally, with a different taxonomy again)
6. Through "Most popular searches" links at the top of the page

7. Through the "This week's highlights"

All of these potential paths are perfectly valid navigation choices but raise an interesting question from a cross-channel perspective. It is perfectly possible for a user to locate their desired product using a path that is unavailable on other channels, thus making the subsequent retrieval of the information difficult. For example compare the number of paths available to an Argos customer on the main website (above) with the number of paths available when using the app: main navigation (which differs to the main website); search; limited, randomised special offers (consisting of only items!).

Therefore some channels have more paths than others therefore the opportunity to discover the desired information is greater on some channels than others. As a consequence, if a user initially locates a piece of information using a path that is not available on other channels (for example, finding a product in the sales section of a main website) the subsequent retrieval of that information will be much harder, from a cross-channel perspective. You quite simply would not know the way back [3]!

Figure 4

Visual Design Aiding the Formation of Semantic Links

In relation to the above point, we felt that the visual design (in particular the use of colour) again suffered from a considerable amount of inconsistency between the different channels. In particular, the physical world channels (for

example the catalogue) had a very distinctive "look and feel" that was not carried over into any of the digital channels.

It was felt that the colour palette and interaction design patterns utilised in the Argos cross-channel experience could have been better applied to carry intrinsic semantic meaning between channels to aid users in their information retrieval tasks.

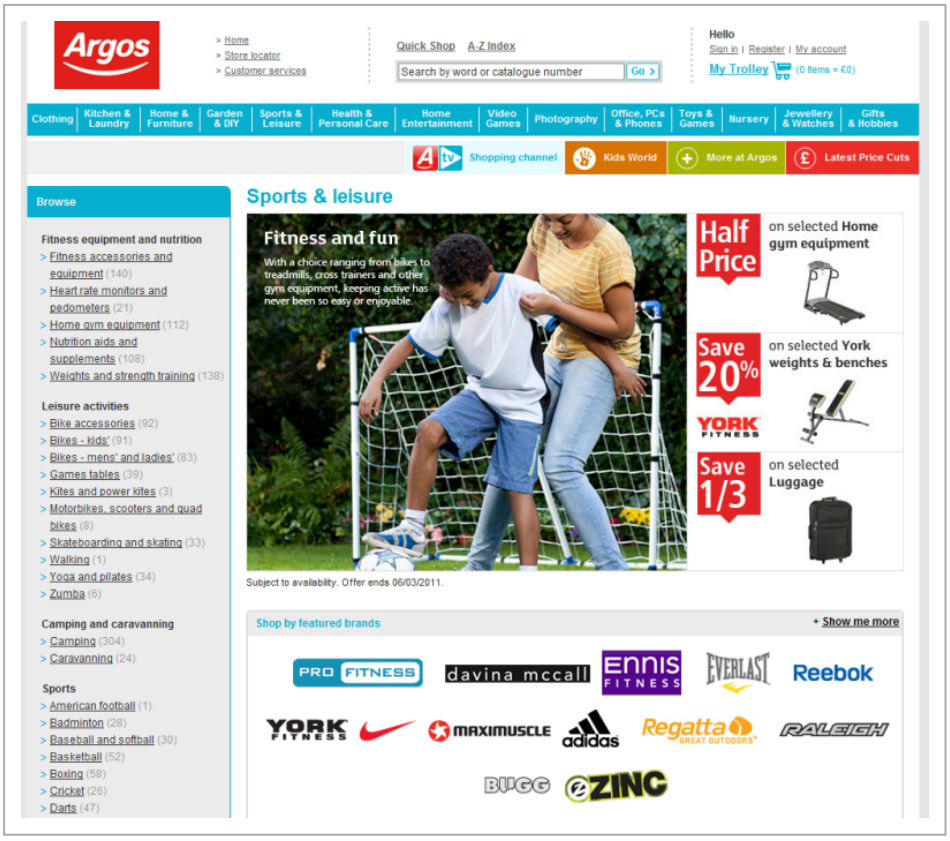

Figure 5

In support of the concepts of correlation and information scent, it was clear to the authors that as well as hierarchical relationships conveying meaning, the visual design elements of the Argos cross-channel experience had the potential to aid the conveying of semantic understanding.

The results of the pilot study raise a critical consideration regarding the use of interaction design patterns (IDPs). Whilst many IDPs used for desktop websites have been established over the last eighteen years, IDP's for smaller screen devices (i.e. smartphone and tablet) often provide IDPs that are either novel (new) or emerging.

The inherent understanding and meaning that come with a given IDP is analogous to mental models (and thus the formation of architectures of meaning).

The greater a person's digital literacy the greater their ability to familiarise themselves with a device or channel and begin using it. The reverse is also true that a lower level of digital literacy could be a limiting factor which does not allow people to flow from device to device or from one to another because they are not familiar with the IDP being presented and have no mental model against which to compare it.

What Information Needs to be Carried?

The above points identified in the evaluation of the Argos cross-channel experience repeatedly raised the same question in our minds: What information is the user required to carry with them?

The issues of inconsistent vertical taxonomies, variance in path choice and visual design aiding semantic linking all impact a user's ability to re-locate previously found information4. Therefore, the user is required to remember the location of information or have suitable functionality available to them to "bridge" the channel gap.

For example, it became clear that in certain channels the ability to bookmark (both physically and digitally) pages, share links, or email links to themselves was vital in aiding subsequent retrieval of information.

In our own experience, the provision of wish lists and shortlist functionality has proven invaluable in aiding both repeat visitation to the same channel as well as subsequent information retrieval across multiple channels. Such functionality greatly aids the cross-channel success rates by effectively carrying the information load for the user to the next channel, wherever that might be. Where this "information carrying" functionality has been seen to be absent, users would be thrown to the vagaries of any individual channel where they could be adversely affected by issues such as inconsistent vertical taxonomies.

For example during our evaluation of the Argos cross-channel experience, the main website product pages provided users with the ability to email and share pages.

However in the mobile optimised website and the mobile application, no such sharing and emailing functionality was provided. Thus users could

potentially find a product on a mobile platform but they have no easy way of storing the information for future retrieval on another channel.

The acknowledgement of the key role that sharing and email functionality can provide raises the importance of information needs that need to be carried across a channel (in the example of Argos, transferring product catalogue numbers between channels would prove invaluable). Proposing the provision of functionality that can "carry information" for the user supports the earlier discussion on cognitive load and its adverse effect in cross channel experiences.

It is our proposition that as we move towards a framework for the creation of architectures of meaning then the identification of information needs and supporting them as they are carried between channels will be essential.

Failure States and Next Steps

A final pertinent point identified during the evaluation of the Argos cross-channel experience was the impact of various failure states. For example, the mobile optimised website and app both insisted on anchoring the user to the nearest Argos retail store. However, the product we were interested in reserving and purchasing was out of stock. As a result no logical next step was presented to the user. Argos didn't offer opportunities to reserve or request the item although they did enable a wider search to other stores. "Out of stock" is potentially a very common reason for channel switch.

The impact of this failure state is interesting in terms of information foraging theory. The information patch that the user is foraging in is in fact empty. The user is forced to reset their search on another channel and no support is offered. For example, (as noted above) despite the user finding the desired product the failure state stopped them in the tracks but did not enable them to bookmark or share the product catalogue number. The user is forced to change channel and start their information forage from the beginning. In terms of our development of a framework for the development of architectures of meaning, the identification of likely failure states that force channel switch could prove just as important as the identification of "natural" entry and exit points on channels.

General Commentary on the Pilot Study

As stated earlier, the purpose of our evaluation of Argos, was to explore and test many of the theories discussed in this paper. We acknowledge that

this small pilot study is an insufficient sample to draw concrete conclusions but it has proved invaluable in raising further questions and expanding our framework further.

Conclusions

One aim of this paper was to explore the potential factors that lead to the development, flow and degradation of meaning throughout a cross-channel experience. We have argued that by identifying how understanding can degrade, designers will be in a stronger position to create resilience in our cross-channel information architectures.

Secondly, we have started to identify a classification scheme for early channel definition. By classifying our channel types very early in our design process then we are able to start with a clear definition of the role that any particular channel will play in our cross-channel experience5. This in itself can be used to look holistically at how different channels can work together to support the construction of understanding across channels.

When we know what each channel is supposed to be doing and we know how understanding can degrade on a given channel, then we believe we are at the starting point for the design of successful cross-channel information architectures. By providing resilient and strong informational layers, it is proposed that it will become easier for users of our systems to form accurate conceptual models that support their goals i.e. Architectures of Meaning.

From our work thus far, we have found ten major implications for the design of cross-channel experiences:

1. in the digital age, the cost of moving channel (i.e. moving "food patch") is very small. Therefore, if our information layer is weak or ill-informed the likelihood of a user leaving our service or changing to an alternative channel is high;

2. when looking for information in a cross-channel user experience, users are effectively conducting a number of evaluations when moving through and across our channels. They are effectively asking themselves "What is the likelihood that this channel can satisfy my informational needs?" In the event that the answer of that question is "Low" then the user will either switch channel or leave the service entirely;

3. we should not under estimate the effect that switching channels can have in reducing or eliminating information scent. Every time a user changes channel they are effectively resetting the information path and beginning a new information forage;

4. we should not under estimate the role of time in diminishing information scent for a user. As demonstrated earlier, the length of time between users switching between channels can range from seconds to days. How do we design strong information scents to accommodate this design challenge?

5. clear and immediate proximal cues will need to be provided for the major informational needs on all major entry points for a channel. Therefore, we must identify those information needs early in the design process;

6. we need to identify the information needs that need to be carried between channels and provide suitable digital functionality (for example, email links and social sharing) that can carry the information scent for us;

7. basic consistency in vertical taxonomies is essential for the reinforcement of a strong information scent across channels;

8. the number of navigational paths that a user has available to them in any given channel is an important consideration in the success of future information retrieval in alternative channels. How can we aid people in their information retrieval when some channels offer a single path whilst others offer as many as eight or more?

9. we need to identify the types of failure states that can result in channel switch in a cross-channel experience as well as the "natural" exit points for a task. For example, an "out of stock" result would immediately halt a users' task and necessitate a channel switch (a "forced abandonment" as opposed to a "natural abandonment) just as much as a successful information retrieval;

10. we have to acknowledge that the digital literacy of the user and the relative maturity of some channel IDPs (in comparison to physical and desktop website IDPs) could have major impacts in the success of our cross-channel experiences. It is hoped that with time, the impact of this will diminish as our industry moves forward and more established IDPs are recognised by both designers and end users.

A Framework for Creating Architectures of Meaning

Taking these design heuristics forward, a core goal of this paper has been to create a practical framework that can be used to aid the development of cross-channel information architectures that create greater meaning and understanding for users. We contend that the creation of successful cross-channel information architectures requires a four step process:

1. define the channel informational types so that we can identify the strategic role each channel will play in the wider user experience being designed. Thus far five initial channel definitions are proposed (see page);

2. identify and track the major informational needs (the "need to knows") across the channels. In particular track and identify the information needs that are carried and used at the major entry points for each channel to mitigate the effects of channel switching and ensure proximal cues are present to maximise informational scent;

3. identify functionality that can "carry" key informational needs for the user between channels. The provision of "carrying" functionality at suitable points of each channel can reduce (or even remove) the cognitive load of the user prior to their channel transition;

4. identify consistent and well established interaction design patterns (IDP) that contain inherent semantic links in their interaction and visual designs that transcend channel boundaries.

At the time of writing, we are continuing the work programme outlined in this paper. We believe that a suitable graphical representation for the definition of channels and the identification and tracking of information needs can be developed that will aid all parties within a cross-channel experience design team. We look forward to developing these "Meaning Maps" and refining our research further in the near future.

Ultimately, it is our design intention to arrive at a practical framework that can be used early in a design lifecycle to lay the foundations for the creation of architectures of meaning.

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Footnotes

[1]. Locating information previously found on another channel being a common activity in a "browse and search" scenario.

[2]. For example each product page on the main Argos website enables a user to email the product to someone else. It's entirely possible for a user to land directly onto a product page without ever navigating through the site. An interesting problem from a cross-channel perspective when a user visits a new channel and is forced to use the navigation for the first time.

[3]. The availability of given navigational paths on different channels raises interesting questions about the potential for responsive web design techniques to provide further benefit in a cross-channel context.

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