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# Préambule

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Une telle démarche ne va pas de soi. Aussi, il convient de la mettre largement à l'épreuve, d'en expérimenter les effets dans d'autres contextes, d'accompagner sa recherche avec elle et de mettre à profit différentes rencontres possibles autour d'elle, le retour de la part des autres étant essentiel pour savoir ce que l'on a écrit ».

L'écriture produit ou modifie la pensée et ses formes.

Yves REUTER

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# Représentation, noyau central d'une marque commerciale et intention d'achat : le cas du vin

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## Résumé

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La marque « commerciale » de vin est accusée en Recherche de ne pas avoir un véritable rôle de marque. A contrario, cet article tente de montrer, via la mobilisation de la théorie du noyau central de Michel (1999) où l'image de marque est issue des représentations, que la marque « commerciale » de vin est crédible: elle possède un noyau central, se traduisant significativement par une intention d'achat. Les analyses réalisées permettent de confirmer globalement la validité prédictive du noyau central de la marque commerciale de vin ; celle-ci impacte avant tout les consommateurs occasionnels plutôt que les experts ; en revanche, l'âge n'apparaît pas comme une variable discriminante.

## Mots clés

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Marque commerciale de vin, marketing du vin, noyau central, appellation d'origine.

# Introduction

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La marque s'est forgée une place prédominante sur le marché de la consommation (Michel, 1999). La marque peut se définir comme « un nom, un terme, un symbole, un dessin ou toute autre combinaison de ces éléments servant à identifier les biens ou les services d'un vendeur ou d'un groupe de vendeurs, et à les différencier des concurrents » (Kotler et Dubois, 2004). La marque est un concentré d'informations, elle agit comme un signal de qualité constante pour les consommateurs, car elle symbolise une standardisation des propriétés du produit. Son rôle est de simplifier le choix du consommateur en se substituant à d'autres informations.

Qu'en est-il de l'univers du vin ? Le vin nécessite en marketing des problématiques propres et un champ de recherche spécifique (Aurier et Sirieix, 2004). Selon Lockshin (2004), la marque revêt dans le vin une pluralité d'acceptation, qui en fait un « bouquet d'attributs » (« brand constellation »); ce concept englobe à la fois la marque de vin elle-même (ou marque « commerciale » de vin), mais aussi d'autres attributs du vin comme l'appellation, la région, le nom du domaine ou même le cépage, qui sont souvent considérés comme des marques par le consommateur : d'où une grande confusion.

Comment définir le concept de marque « commerciale » dans le vin ? Selon Viot et Passebois-Ducros (2005), une distinction doit être faite entre « vin de marque » (concept de marque commercial transposé dans le domaine du vin) et la « marque de vin » (acceptation plus large désignant les signes de marquage - appellations, cépages, régions - faisant office de marque pour le consommateur). Les « vins de marque » stricto sensu sont des vins « faisant l'objet d'une stratégie marketing bien définie pour l'ensemble des éléments du mix (prix, produit, communication et distribution) », « réalisés à partir de vins d'assemblage élaborés par des négociants ou des coopératives, commercialisés sous des marques fortes, visant une qualité constante et une production à grande échelle ». Par souci de clarification, ce dernier énoncé sera retenu dans notre recherche pour la définition de la marque « commerciale » de vin.

En Recherche, la marque commerciale de vin souffre d'être associée à une qualité inférieure par les consommateurs français (Viot et Passebois-Ducros, 2005), d'être associée à des vins bas de gamme (Coelho et d'Hauteville, 2006), et de ne pas avoir une véritable fonction de marque (Korchia et Lacoëuilhe, 2006). En somme, l'utilité de la marque « commerciale » de vin est mise en question.

Or, les volumes vendus sous des marques commerciales de vin ont triplé en France ces cinq dernières années.

Il apparaît donc pertinent de s'interroger sur ces conclusions de recherche, notamment à la lumière des faits suivants : les consommateurs occasionnels de vin représentent la majorité (41 %) des consommateurs de vin en France<sup>1</sup>, et leur nombre continue de progresser ; cette baisse de la fréquence de consommation se double d'une rupture générationnelle (Amine et Lacoëuilhe, 2007), les jeunes générations étant sous ou non consommatrices de vin. Tous ces phénomènes laissent présager une évolution des représentations du vin.

Pour cela, la théorie du noyau central de Géraldine Michel (1999) sera mobilisée, sa spécificité étant d'étudier l'image de marque à partir des représentations. L'examen de la validité prédictive du noyau central vis-à-vis de l'intention d'achat permettra de « comprendre plus particulièrement les liens existant entre les consommateurs et les marques » (Ambroise, Michel, Valette-Florence ; 2005), dans le cas particulier de la marque commerciale de vin, et pour les types de consommateurs cités ci-dessus (consommateur occasionnel vs régulier/expert : consommateur jeune vs adulte).

L'intérêt de notre recherche est double :

- sur le plan théorique, la théorie du noyau central de Michel (1999) est-elle applicable à la marque

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<sup>1</sup> Source : Enquête Viniflor-Crego 2005 sur un échantillon représentatif de 4036 foyers français, sélectionnées selon la méthode des quotas par le cabinet ISL.



commerciale de vin? Si les thématiques des représentations du vin d'une part (Simonnet-Toussaint, 2006; Lacoeyllhe, 2007; Saule, 2008), de la marque objet de représentation d'autre part (Michel, 1999) ont déjà été étudiées, la marque commerciale de vin, comme objet des représentations sociales, n'a pas fait l'objet d'études spécifiques. De plus, si Viot et Passebois-Ducros (2005) ont abordé la perception de la marque commerciale de vin via une étude qualitative, le lien marque/intention d'achat n'a pas été étudié.

- sur le plan managérial, la marque commerciale de vin possède-t-elle un potentiel symbolique suffisant pour prétendre prendre le relais d'une consommation générale de vin déclinante en France?

Le présent article s'articule autour de trois parties. La première partie tente de préciser le concept de représentation et les représentations du vin, ainsi que l'image de marque comme objet de représentation; elle met en exergue les différentes compréhensions de la marque de vin en France, et notamment l'opposition entre l'A.O.C (système prédominant lié au terroir, notion de typicité) et la marque commerciale de vin (phénomène minoritaire basé sur la typicalité). La seconde partie présente l'évaluation de marques commerciales de vin via l'outil de mesure du noyau central, ainsi que son caractère prédictif vis-à-vis de l'intention d'achat. Enfin, l'analyse globale et par types de consommateur des résultats sont présentés, afin de déterminer une perspective pour la marque commerciale de vin tant au niveau de la Recherche que du monde professionnel.

## CADRE CONCEPTUEL

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### Le concept de « représentation »

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Le concept de représentation a été étudié par plusieurs disciplines connexes au marketing.

En psychologie cognitive, la « représentation » est définie de manière générale comme « un ensemble de connaissances ou de croyances, encodées en mémoire, que l'on peut extraire ou manipuler mentalement (...), à des fins immédiates ou différées » (Dortier, 2003). C'est Durkheim en sociologie qui a introduit la notion de « représentation collective » à la fin du 19<sup>e</sup> siècle. Pour Durkheim, le groupe social serait régi par une sorte de système, la « conscience collective », qui rassemblerait un ensemble cohérent de croyances, de sentiments, de souvenirs, pour susciter l'émergence de « représentations collectives ». L'intérêt du concept de « représentations collectives » permet de montrer qu'un individu dans une société est amené à partager des « cadres de pensée préexistants », construits sur la base d'une pensée collective, d'un ensemble cohérent d'idées, de valeurs, de croyances, mais également d'une culture (histoire, lois, coutumes, modes de fonctionnement). (Sales-Wuillemin, 2005).

En psychologie sociale, Moscovici introduit en 1961 le concept de « représentations sociales ». Les représentations sociales font le lien entre l'individu (représentation mentale individuelle) et les représentations collectives (interaction des individus en société), par l'intermédiaire du groupe. Pour Jodelet (1989), la représentation sociale est « une forme de connaissance, socialement élaborée et partagée, ayant une visée pratique d'organisation, et concourant à la construction d'une réalité commune à un ensemble social ».

Les représentations sociales intègrent les caractéristiques objectives de l'objet, les expériences antérieures du sujet, ainsi que les systèmes d'attitudes et de normes culturelles et sociales. Elles répondent à quatre fonctions essentielles (Michel, 1999): fonction de savoir, fonction identitaire du groupe en interne et en externe, fonction d'orientation (elles guident les comportements et les pratiques), fonction justificatrice. Les éléments de contenu d'une représentation sociale présentent une organisation particulière hiérarchique (« noyau central » et « système périphérique »).

## Les représentations du vin comme représentations sociales

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Les représentations du vin dans le cas particulier de la France, sont catégorisables en quatre dimensions (Amine et Lacoëuilhe, 2007) : une dimension hédonique (plaisir sensoriel et rituel de dégustation), une dimension sociale (le vin est un générateur de lien social), une dimension culturelle (le vin touche à l'histoire de la France, aux terroirs régionaux, voire à la religion chrétienne pour les plus âgés), et une dimension d'authenticité.

Ces quatre représentations du vin en France auprès d'une population de tous âges sont confirmées pour la cible des « jeunes adultes » (18-30 ans et 20-25 ans) par Céline Simonnet-Toussaint (2006) : en France, le vin est avant tout associé à la gastronomie, aux plaisirs de la table, à la famille et à la convivialité. Plus encore, ce qui frappe, c'est la dimension « identitaire » et « inconsciente » des représentations du vin par les jeunes adultes, matérialisée par le fait que la culture du vin se transmet via la figure paternelle, et la permanence d'évocation des repères identitaires (région, nation, France). Les représentations du vin en France sont avant tout liées au terroir.

### Le concept de marque comme objet des représentations sociales : théorie du noyau central (Michel, 1999).

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Géraldine Michel a été la première à introduire en marketing les travaux d'Abric (1994) et de Moliner (1995) sur les représentations sociales.

La spécificité de la théorie du noyau central définie par Michel (1999), par rapport à d'autres concepts évaluant la marque ou l'image de marque (identité de marque (Kapferer, 1991), territoire de marque (Changeur, 1999), capital de marque (Keller, 1993), personnalité de marque (Aaker, 1997)), est de délimiter l'image de marque à partir de la notion de représentation sociale. « L'image de marque correspond à l'ensemble des représentations sociales que le consommateur associe à la marque » (Michel, 2004).

Une telle définition de l'image de marque paraît bien adaptée à l'étude de la marque commerciale de vin, dans la mesure où le vin en France est un produit identitaire, riche de représentations culturelles, historiques et sociales.

Ces représentations sociales se définissent à partir d'associations attribuées à la marque ; ces associations représentent en fait toute information liée à la marque dans la mémoire des individus. Le rappel en mémoire de la marque, ainsi que le nombre d'associations susceptibles d'être activées à la mention de la marque, dépend de l'intensité des liens qui relient la marque aux associations qui lui sont rattachées (Michel, 2004).

L'approche par les représentations sociales implique que la marque soit une entité sociale partagée par l'ensemble des individus participant au champ social. « La représentation d'une marque est avant tout la représentation d'un individu inscrit dans un univers socio-culturel. La marque est non seulement une représentation cognitive (Ladwein, 1993), mais elle est aussi sous l'influence des antécédents culturels (connaissances, habitudes, valeurs, etc.) » (Michel, 1999).

La marque est donc un « objet de représentation », « un objet social organisé » autour d'un noyau central et d'un système périphérique (Michel, 1999).

Le noyau central est l'élément fondamental de la marque. Il regroupe les associations qui sont perçues par une majorité de consommateurs comme indissociables de la marque. Les consommateurs fidèles ne reconnaissent plus la marque si celle-ci ne se conforme pas aux associations centrales. Le noyau possède une double fonction : fonction organisatrice (le noyau détermine les liens qui unissent les éléments de la marque), et fonction génératrice (le noyau donne sa signification aux autres associations de la marque). Le noyau central est donc le cœur de la signification de la marque : il évolue de manière très lente, et correspond en fait au territoire de marque.

Les associations présentes dans le système périphérique ne sont pas au cœur de la signification de la marque ; leur remise en cause affecte beaucoup moins le changement d'attitude envers la marque. Le

système périphérique possède deux fonctions essentielles de concrétisation (il intègre les éléments tangibles au sein de la représentation de la marque) et d'adaptation de la marque (il permet des modifications progressives d'image de marque sans heurter la signification fondamentale de la marque).

## Lien noyau central/comportement envers la marque

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Les associations attribuées à la marque peuvent être perçues comme positives, négatives ou neutres (Keller, 1993), et jouent un rôle évaluatif dans le jugement que les consommateurs portent sur la marque. Selon le modèle bidimensionnel de Moliner (1996), le noyau central et le système périphérique regroupent à la fois des cognitions descriptives et évaluatives. Certaines des associations centrales et périphériques ont une influence sur le comportement des individus face à la marque (Ambroise, Michel, Valette-Florence, 2005). La mobilisation de la théorie du noyau central comme outil de mesure de l'image de marque permet de mettre en exergue les liens éventuellement existant entre la perception et le comportement du consommateur envers la marque.

Une telle définition de la « marque comme objet de représentation sociale » paraît particulièrement pertinente dans le cadre de l'étude de la marque commerciale de vin en France ; mais qu'en est-il de la marque de vin et comment la définir ? Et peut-on facilement transférer le concept d'image de marque, porteur des représentations sociales, à la sphère du vin ?

## Différentes compréhensions de la marque de vin en France : opposition typicité (A.O.C) et typicalité (marque commerciale de vin)

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La marque de vin revêt en France une grande diversité ; les différents concepts rencontrés sont celui de la marque de vin au sens juridique, de la marque collective avec l'A.O.C (notion de typicité), et enfin de la marque commerciale de vin et de MDD (notion de typicalité).

Lockshin (2004) définit la marque de vin comme un faisceau ou bouquet d'attributs (« brand constellation ») ; cette définition illustre à elle seule la multiplicité des acceptations du concept de marque de vin en France (marque commerciale, appellation, région, nom du domaine, cépage), mais aussi la confusion régnant dans l'esprit des consommateurs.

Cette confusion est renforcée par la définition juridique de la marque : celle-ci peut faire l'objet d'un dépôt de marque de vin via un toponyme (soit un lieu-dit ou un vin de château en A.O.C), via le nom d'un propriétaire actuel ou ancien, ou via un nom fantaisiste (du moment qu'il n'est ni déceptif ni trompeur) (Viot et Passebois-Ducros, 2005). Une définition aussi large explique la prolifération des marques/châteaux, notamment en A.O.C générique : il y aurait près de 12 000 châteaux dans le Bordelais.

Ces deux définitions sont intéressantes, mais elles ne rendent pas possible la classification des différents types de marques de vin. D'autres auteurs (Ladwein, 1993 ; Korchia et Lacoëuilhe, 2006 ; Giraud, 2001) utilisent les notions de « typicité » et de « typicalité » pour mieux définir le concept de « marque de vin ».

## La typicité

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Un produit agro-alimentaire peut avoir comme avantage concurrentiel la typicité du produit. La typicité garantit un goût unique et spécifique lié à la formulation du produit, à l'origine des matières premières, et à leur procédé de production et de conservation. En effet, selon Giraud et Sirieix (2000), un aliment typique se fait remarquer grâce à l'affirmation d'un trait de caractère unique. Dans le cas du vin, la typicité fait référence à l'origine, à l'identification au terroir, au cépage.

L'A.O.C (Appellation d'Origine Contrôlée) représente le système le plus abouti de la « doctrine terroir » en France et de la « marque collective de vin ». L'A.O.C est la clé de voûte de la filière viticole française, avec en 2007 près de 450 A.O.C. Pour valoriser la production, la filière viticole française a historiquement choisi la stratégie de l'appellation d'origine, délaissant en parallèle la marque commerciale de vin. L'A.O.C est un système réglementaire dans lequel le terroir et le système de production sont les garants d'une qualité supérieure et de la typicité des produits. L'A.O.C, en phase avec les évolutions du marché (« on boit moins mais mieux »), a contribué jusqu'à la fin des années 90 au succès des exportations françaises (Coelho et d'Hauteville, 2006). Néanmoins, ses caractéristiques et sa complexité posent aujourd'hui question.

L'A.O.C fonctionne-t-elle comme une marque? Lorsque l'appellation joue un rôle d'identifiant principal, elle devient en effet une marque, avec une « dimension collective » (Coelho et d'Hauteville, 2006). Le producteur, s'il respecte le cahier des charges de l'appellation et que ses vins sont agréés, bénéficie de la notoriété et de l'image de la « marque collective ».

Néanmoins, le rôle de marque dévolu à l'A.O.C peut être discuté. En effet, « le système A.O.C » présente plusieurs failles: qualité hétérogène (les conditions de production à la parcelle ne sont pas respectées par certains vigneron), écart de prix trop important au sein de la même appellation, gestion collective des producteurs problématiques.

Au total, ces incohérences sont à l'opposé de la définition classique de la marque, qui doit garantir une qualité constante et un positionnement prix homogène. Enfin, la complexité du système A.O.C implique une telle richesse des représentations associées, que celui-ci s'adresse en priorité à un consommateur expert.

## La typicalité; définition de la marque commerciale de vin.

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Au principe de « typicité » s'oppose celui de « typicalité ». Les marques commerciales ou MDD relèvent de la « typicalité », dans la mesure où elles visent à être considérées comme le vin le plus représentatif de leur catégorie d'appartenance, soit la définition d'une offre homogène et d'une qualité stable, souvent définie à partir des besoins du consommateur. « Le renvoi à cette notion de typicalité vise à simplifier le choix du consommateur et à éliminer toute surprise en développant une préférence gustative par habitude » (Korchia et Lacoëuilhe, 2006).

En France, dans la grande distribution, 65 % des bouteilles de Bordeaux seraient vendues comme marque de vin (Kapferer, 2002). Ce chiffre cache un triple constat: un fort poids des marques distributeurs, un faible poids des marques « commerciales » de vin, des marques dénommées comme telles uniquement de par leur statut juridique.

La vingtaine de marques commerciales de vin significatives ne représente que 2 à 4 % des ventes de vin en France (Coelho et d'Hauteville, 2006, données 2004). À l'inverse, dans les pays anglo-saxons, la marque commerciale de vin s'est considérablement développée: une marque comme Gallo (marque d'origine américaine) occupe une place prépondérante sur le marché international.

En partant de la définition de Viot & Passebois-Ducros (2005), la marque commerciale de vin peut être définie par une qualité constante et régulière issue de vin d'assemblage (volonté de respecter chaque année une constante qualitative et quantitative répondant le mieux aux attentes des consommateurs), une marque soutenue régulièrement par des actions marketing (afin de développer la notoriété et l'image de marque), une étiquette avec des informations simplifiées (véhiculant une représentation idéalisée et accessible du vin).

En Recherche, les marques « commerciales » de vin subissent une triple critique :

une absence de lien au terroir, un déficit d'image chronique et une qualité médiocre, la négation de leur rôle de marque.

« Le consommateur français est attaché à l'origine du vin, et se méfie de ce qui peut apparaître comme un vin industriel » (Coelho et d'Hauteville, 2006). Le consommateur, de par son implication dans l'activité de consommation du vin, est souvent attaché à une région, à un terroir, à un producteur. « Le consommateur français a du mal à apprécier un système de marquage qui gomme une partie de l'histoire du vin » Amine et Lacoëuilhe,

2007). En somme, la marque « commerciale » de vin viendrait donc en France briser « le lien identitaire » entre le vin et l'individu.

Les marques commerciales de vin sont nées à l'origine sur le segment bas de gamme des vins de table (comme Vieux Papes), un segment caractérisé par une piètre qualité et l'absence de référence géographique. La marque « commerciale » de vin souffrirait donc d'un déficit d'image chronique (Korchia et Lacoëuilhe, 2006).

Les marques commerciales de vin ne sont pas perçues comme telles, mais comme des châteaux ou des appellations spécifiques liées à un terroir. De plus, l'atomisation du marché en de nombreuses références freine la mémorisation de ces marques. En conséquence, « les marques de vin n'exercent pas leur rôle, contrairement à d'autres alcools tels que Ricard, Chivas ou encore des marques de champagne » (Korchia et Lacoëuilhe, 2006).

« Les vins marketés souffrent d'un déficit d'image dans l'esprit des consommateurs. Les négociants commercialisant de tels vins devront renforcer dans un premier temps leur capital marque en améliorant leur notoriété et leur image ; dans un second temps, ils devront accroître leur impact sur le comportement du consommateur et créer une préférence, voire de la fidélité ou de l'attachement pour telle marque, comme la plupart des autres produits de l'agro-alimentaire » (Viot et Passebois-Ducros, 2005).

A contrario, l'objet du présent article tentera de démontrer que la marque commerciale de vin, objet de représentations simplifiées du vin, possède un noyau central ayant la capacité de se transformer en acte d'achat. La recherche est centrée sur l'étude du noyau central, qui représente le cœur de signification de la marque. Le système périphérique est présenté sans plus d'approfondissement.

## LES HYPOTHÈSES DE RECHERCHE

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La marque commerciale de vin possède-t-elle un noyau central, impactant le comportement d'achat ? Or, « c'est le niveau de crédibilité accordé à une marque ou à un signe de marquage qui va déterminer si celui-ci a une incidence sur son comportement d'achat » (Larceneux, 2003). Dans notre cas, le comportement des individus envers la marque (dimension conative) est évalué par l'intention d'achat.

En conséquence, notre hypothèse devient :

**H1** : « Il existe une relation entre les associations du noyau central de la marque commerciale de vin et leur intention d'achat respective ».

Selon la recherche exploratoire de Viot et Passebois-Ducros (2005), la perception de la marque commerciale de vin diffère selon les experts et les autres consommateurs (grand public). Notre apport sera de quantifier ce résultat via le lien noyau central/intention d'achat, en isolant bien les consommateurs réguliers/experts des consommateurs occasionnels. Par ailleurs, selon Perrouty, d'Hauteville et Lockshin (2004), les experts utilisent avant tout les variables intrinsèques (qualité gustative du produit), et rejettent la marque (variable extrinsèque) comme facteur influençant l'achat d'un vin. Ces deux résultats permettent la formulation des hypothèses suivantes :

**H2A:** « Plus le consommateur de vin est occasionnel, plus les associations du noyau central des marques commerciales de vin sont évaluées positivement ».

**H2 B:** « La fonction prédictive du noyau central des marques commerciales de vin est plus élevée pour les consommateurs occasionnels de vin que pour les consommateurs de vin réguliers/experts »

Un lien a été fait entre la fréquence de consommation, lorsqu'elle était élevée, et l'expertise (consommation de vin plus de trois fois par semaine pour un consommateur régulier vs au moins une fois par semaine pour les occasionnels). En effet, la fréquence de consommation implique une meilleure connaissance du vin. Les consommateurs « réguliers » ont donc été assimilés à des « experts ».

Amine et Lacoeuilhe (2007) ont montré l'importance de la rupture générationnelle dans la consommation du vin, ainsi que les modifications potentielles des représentations du vin auprès des jeunes. En conséquence, les jeunes sont-ils plus sensibles à la marque commerciale de vin, porteuse de représentations simplifiées du vin, et l'évaluent-ils mieux que les adultes? D'où nos deux hypothèses :

**H3A:** « Plus le consommateur de vin est « jeune » (entre 20 et 25 ans inclus), plus les associations du noyau central des marques commerciales de vin sont évaluées positivement ».

**H3 B:** « La fonction prédictive du noyau central des marques commerciales de vin est plus élevée pour les consommateurs de vin « jeunes » (entre 20 et 25 ans inclus) que pour les consommateurs de vin « adultes » (plus de 30 ans) ». Selon Simonnet-Toussaint (2004), le choix de la tranche d'âge (20 ans) correspond à l'entrée dans le monde du vin des jeunes générations.

## MÉTHODOLOGIE

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La présentation de la méthodologie de travail se décompose en trois parties : sélection des marques étudiées, présentation de l'outil de mesure pour les différentes variables, et description de l'échantillon.

### Sélection des marques étudiées

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Une enquête préliminaire a été développée auprès d'un échantillon de convenance de 28 personnes au total (divisé pour moitié en « Jeunes de 20-25 ans » et pour moitié en « Adultes » de plus de 30 ans), afin de sélectionner des marques commerciales de vin ayant une notoriété assistée significative. Les marques Listel, Malesan, Vieux Papes, et Mouton Cadet ont été retenues. Elles sont en outre chacune représentatives des segments et des prix proposés au consommateur.

### Présentation de l'outil de mesure des différentes variables (noyau central, intention d'achat) et échantillon

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La démarche retenue s'inscrit dans une approche positiviste et hypothético-déductive, même si elle intègre en phase initiale une approche qualitative (démarche inductive).

Le design de la recherche est calqué sur la méthode préconisée par Michel (1999).

<b>Détermination du Noyau Central (Michel, 99)</b>	<b>Méthodologie utilisée et question type</b>	<b>Échantillon, test statistique &amp; résultat</b>
<p><b>PHASE 1</b>  <b>QUALI</b> : générer des associations liées à chacune des quatre marques de vin (Malesan, Listel, Vieux Papes, Mouton Cadet).</p>	<p>Entretien semi-directif (cf. guide d'entretien) et/ou méthode des citations directes  (Possibilité de coupler les 2 méthodes : G Michel, R.A.M 99, p 41).  « Qu'est-ce qui vous vient à l'esprit si je vous parle de la Marque X ? » (Malesan par exemple).  Relance: « Qu'est-ce qui vous vient à l'esprit si je vous dis Malesan et une association (citée précédemment)? »</p>	<p>Échantillon Quali : selon principe de saturation (Mucchielli, 1991).  28 personnes interrogées (jeunes occasionnels, jeunes réguliers, adultes occasionnels, adultes réguliers)  * Résultat : obtention d'une liste d'associations sur chacune des marques de vin présentées (élimination des associations redondantes)</p>
<p><b>PHASE 2</b>  <b>QUANTI 1</b> :  Force des associations :  Sélection des associations/images les plus fortes pour chacune des quatre marques de vin.</p>	<p>Questionnaire auto administré n° 1  Voici des images généralement associées à la marque de vin « Malesan » ; à quel point ces images sont-elles associées à la marque Malesan ?  1 (pas du tout associée)/7 (tout à fait associée)</p>	<p>- Échantillon de convenance 120 individus  - 30 jeunes « occasionnels »  - 30 jeunes « réguliers »  - 30 adultes « occasionnels »  - 30 adultes « réguliers/experts »  * Résultat : sélection des images/associations dont la force <math>\geq 5</math> sur 7 pts (Likert).</p>
<p><b>PHASE 3</b>  <b>QUANTI 2</b> :  Détermination du noyau central et du système périphérique :  identification des associations centrales et périphériques</p>	<p>Questionnaire auto administré n° 2  Utilisation méthode de la réfutation (Moliner, 1996):  - « Si le produit n'est pas (association), peut-il être de la marque Malesan ? »  1 (il ne peut pas du tout être de la marque « X ») à 7 (il peut tout à fait être de la marque « X »).  Si (1,2, 3) : les associations appartiennent au noyau central.  Si (4,5,6,7) : les associations appartiennent au syst. périph.</p>	<p>Échantillon de convenance 120 individus  (échantillon idem Quanti 1)  - 30 jeunes « occasionnels »  - 30 jeunes « réguliers »  - 30 adultes « occasionnels »  - 30 adultes « réguliers/experts »  *Résultat : identification des images appartenant au noyau central et au système périphérique via le test du Chi-deux d'inférence unilatérale, significat. = 1 %.</p>
<p><b>Mesure de l'Intention d'achat</b></p>	<p>I.A: « Si je dois acheter un vin, j'achèterai la marque Malesan »  (1 Pas du tout d'accord ; 7 Tout à fait d'accord).</p>	

Trois phases majeures peuvent être distinguées (cf. tableau ci-dessus) :

La phase n° 1 qualitative vise à générer des représentations sur les quatre marques de vin étudiées via des entretiens semi-directifs et la méthode des citations directes. Vingt-huit personnes ont été interrogées selon le principe de saturation (Mucchielli, 1991). Elles se répartissent en quatre groupes de sept individus (jeunes consommateurs occasionnels vs réguliers, adultes consommateurs occasionnels vs réguliers), étudiants en École de Commerce (pour les 20-25 ans) ou adultes de plus de 30 ans. Les associations redondantes ont été ensuite éliminées via des experts extérieurs

L'objectif de la phase n° 2 est de sélectionner les associations (issues de la phase n° 1) les plus représentatives (soit une force d'une moyenne égale ou supérieure à cinq sur une échelle de Likert en sept points). Dans la phase n° 3, les associations (issues de la phase n° 2) sont identifiées puis départagées entre associations centrales ou périphériques, via la méthode de réfutation de Moliner (1996) ; cette méthode postule que la remise en cause d'une association centrale entraîne une modification de sens de la marque. Les associations sont considérées comme appartenant au noyau central lorsque la proportion de personnes qui réfutent la marque (1-2-3) est significativement différente d'une réponse théorique (50/50). Pour cela, un test du chi-deux a été utilisé, avec significativité au seuil de 1 % (cf. annexe A3).

Pour chacune des phases n° 2 et n° 3, le questionnaire a été d'abord saisi sur Sphinx 2000, puis a été diffusé aux cent vingt répondants ciblés via un questionnaire auto administré sur Internet, pour être enfin basculé sur SPSS 14.0. L'échantillon utilisé est un échantillon de convenance. Les jeunes (20-25ans) sont étudiants dans une École de Commerce du Sud-Ouest de la France, ainsi qu'une partie des adultes (étudiants en formation continue ou 3<sup>e</sup> cycle), ce qui assure une certaine homogénéité de l'échantillon. La moitié des adultes consommateurs réguliers/experts interrogés sont des professionnels de la filière vin.

<b>Total Ech. : 120 individus</b>	<b>Occasionnel</b>	<b>Régulier (expert)</b>	<b>Total</b>
<b>Jeunes (entre 20 et 25 ans)</b>	30 étudiants (Master 1) Jeunes « occasionnels »	30 étudiants (Master 1) Jeunes « réguliers »	60 Jeunes
<b>Adultes (plus de 30 ans)</b>	30 adultes « occasionnels »	30 Adultes « réguliers » (dont 50 % professionnels de la filière vin)	60 Adultes
<b>Total</b>	60 conso. « occasionnels »	60 conso. réguliers/ experts	120 individus

## LES RÉSULTATS

L'objectif de cette partie est de présenter des résultats encore exploratoires (compte tenu du nombre de répondants de l'échantillon) concernant le caractère prédictif du noyau central sur le comportement envers la marque, dans le cas de la marque commerciale de vin.

### Détermination du noyau central des quatre marques « commerciales » de vin.

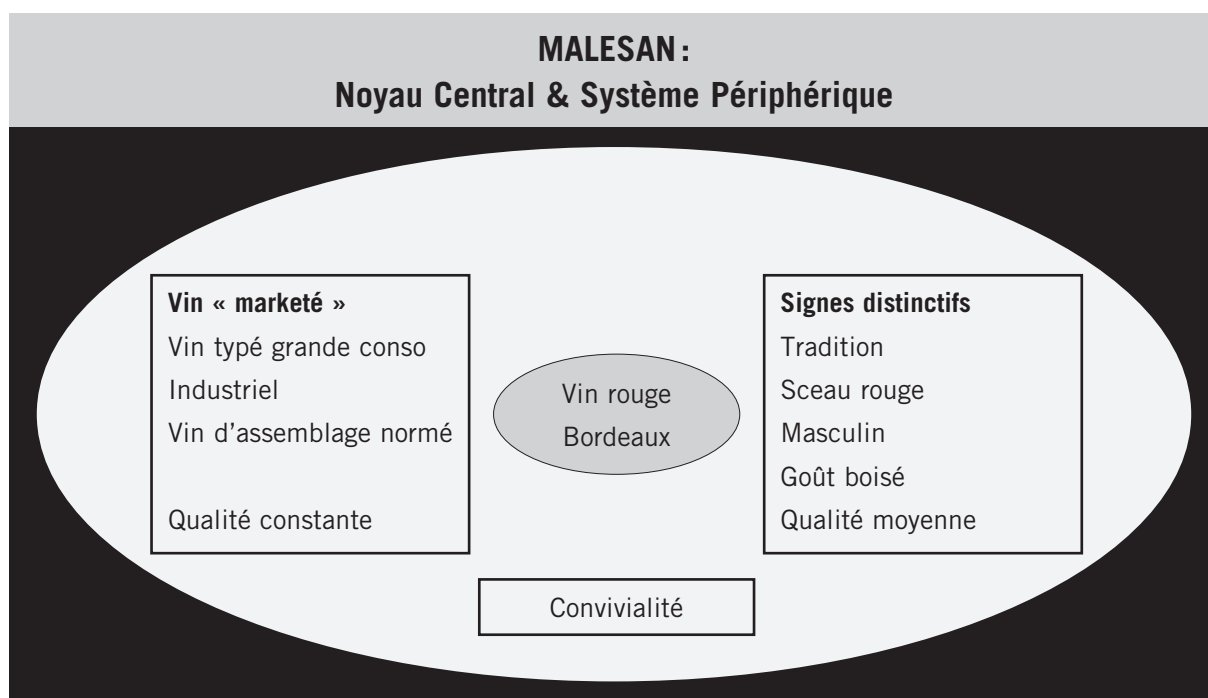
Dans un premier temps (phase 1), l'étude qualitative a permis de générer une liste d'une trentaine d'associations par marque. Les consommateurs ont ensuite retenu les associations dont la force/moyenne était supérieure à cinq sur sept. La troisième phase a enfin permis d'identifier les associations centrales et périphériques de la marque de vin ; les résultats sont présentés dans le tableau suivant :



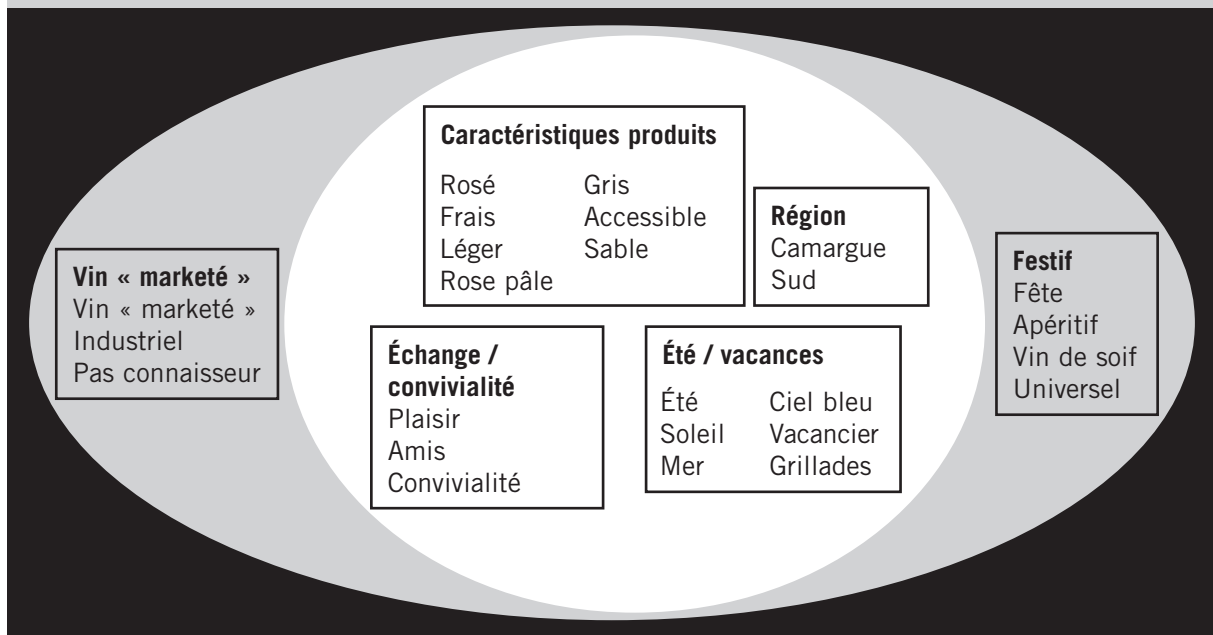
Phase de l'étude	Phase 1 Quali	Phase 2 (Quanti 1)	Phase 3 (Quanti 2)	Phase 3 (Quanti 2)
	Nombre d'associations générées durant la phase qualitative	Nombre d'associations de la représentation de la marque (Force $\geq$ 5)	Nombre d'associations appartenant au noyau central	Nombre d'associations appartenant au système périphérique
<b>Malesan</b>	29	12	2	10
<b>Listel</b>	34	25	18	7
<b>Vieux Papes</b>	30	19	13	6
<b>Mouton Cadet</b>	30	23	23	/

Afin de renforcer la validité interne des résultats, l'échantillon a été partagé de manière aléatoire, et la centralité des associations a été comparée pour chacun des deux échantillons. Le constat est que l'identification des associations centrales et périphériques est systématique dans la majorité des cas.

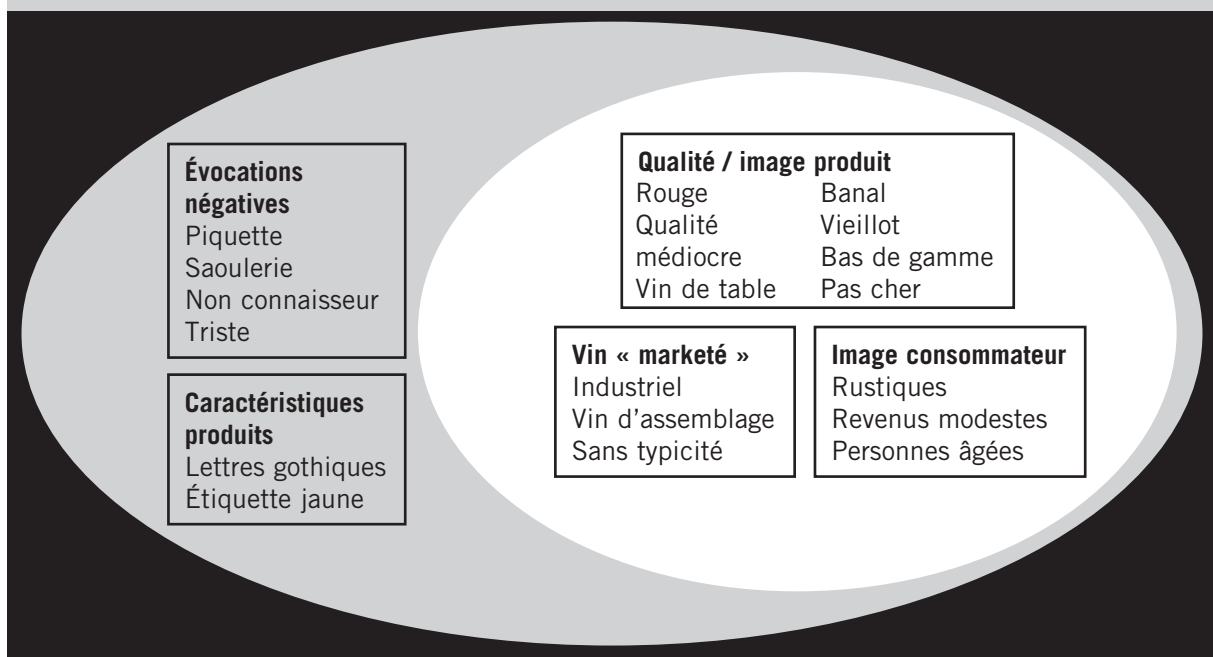
Les représentations de la marque sont présentées dans les pages suivantes. Malesan présente un noyau central concentré autour de deux associations (vin rouge et Bordeaux). Pour Listel et Mouton Cadet, le noyau central est très riche ; l'image de marque de Mouton Cadet est extrêmement bien définie, d'où des associations concentrées uniquement dans le noyau central. Enfin, Vieux Papes présente des associations plutôt négatives, dues au positionnement de Vieux Papes sur le segment déclinant et dévalorisé des vins de table.



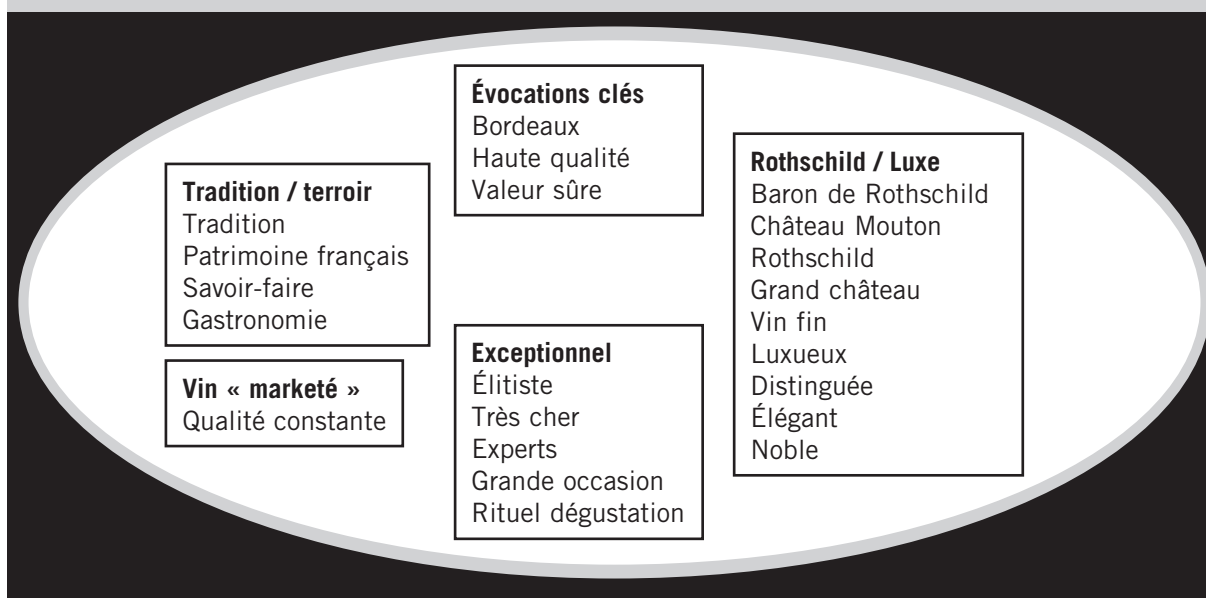
**LISTEL :**  
**Noyau Central & Système Périphérique**



**VIEUX PAPES :**  
**Noyau Central & Système Périphérique**



## MOUTON CADET : Noyau Central & Système Périphérique



	<b>R</b>	<b>R-deux</b>	<b>R-deux ajusté</b>	<b>F de Fischer</b>	<b>Signification</b>
<b>Malesan</b>	0,427	<b>0,182</b>	0,168	13,01	0,00
<b>Listel</b>	0,684	<b>0,468</b>	0,373	4,93	0,00
<b>Vieux Papes</b>	0,374	<b>0,140</b>	0,034	2,32	0,02
<b>Mouton Cadet</b>	0,676	<b>0,456</b>	0,326	3,50	0,00

### Hypothèse H1 (cf. annexe A4)

« Il existe une relation entre les associations du noyau central de la marque commerciale de vin et leur intention d'achat respective ».

Selon la recherche exploratoire de Viot et Passebois-Ducros (2005), la perception de la marque commerciale de vin diffère selon les experts et les autres consommateurs (grand public). Notre apport sera de quantifier ce résultat via le lien noyau central/intention d'achat, en isolant bien les consommateurs réguliers/experts des consommateurs occasionnels. Par ailleurs, selon Perrouty, d'Hauteville et Lockshin (2004), les experts utilisent avant tout les variables intrinsèques (qualité gustative du produit), et rejettent la marque (variable extrinsèque) comme facteur influençant l'achat d'un vin. Ces deux résultats permettent la formulation des hypothèses suivantes :

Les résultats montrent le caractère prédictif du noyau central de chaque marque de vin en intention d'achat : le R-deux traduisant l'intensité de la relation entre le noyau central et l'intention d'achat est significatif pour les marques Listel (0,468) et Mouton Cadet (0,456), et pour une moindre part Malesan (0,182) et Vieux Papes (0,140), avec des tests de Fisher suffisamment élevés et possédant une significativité proche de zéro pour les quatre marques commerciales de vin ; ces résultats sont supérieurs à ceux déjà obtenus dans la littérature pour les marques Absolut (R-deux = 0,043) et Malibu (R-deux = 0,134) (Ambroise, Michel, Valette-Florence, 2005).

L'hypothèse H1 est donc validée.

## Hypothèse H2A (cf. annexe A5)

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La moyenne des évaluations des associations appartenant au noyau central des quatre marques commerciales de vin a été calculée, et ce pour les deux sous-groupes de consommateurs de vin occasionnels (soixante répondants) et réguliers (soixante répondants); puis un test T de moyenne sur deux échantillons indépendants a été réalisé.

La moyenne des évaluations des associations du noyau central est mieux évaluée par les consommateurs occasionnels que par les consommateurs réguliers/experts, et ce, pour chacune des quatre marques commerciales de vin.

Le test de Levene préalable sur l'égalité des variances montre un F de Fisher élevé et une significativité proche de zéro. Le test T de moyenne effectué sur des échantillons indépendants démontre que l'écart entre ces quatre moyennes est significatif au seuil de 1 % pour l'ensemble des marques commerciales de vin.

L'hypothèse H2A est donc validée.

## Hypothèse H2B (cf. annexe A5)

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Le principe est le même que celui développé pour l'hypothèse H1.

Il existe une relation significative pour les consommateurs occasionnels entre noyau central et intention d'achat (F de Fischer suffisamment élevés et des significations proches de zéro); de plus, le R-deux des consommateurs occasionnels est toujours supérieur à celui des consommateurs réguliers/experts pour les quatre marques commerciales de vin, notamment Listel et Mouton Cadet. Pour les experts, on peut supposer au vu de la faiblesse des R-deux, que d'autres variables interviennent dans la relation marque/intention d'achat, notamment la qualité intrinsèque du vin. L'hypothèse H2B est donc démontrée

## Hypothèse H3A (cf. annexe A6)

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L'analyse effectuée est similaire à celle effectuée pour l'hypothèse H2A. Le test de Levene sur l'égalité des variances montre un F très peu élevé, et une significativité proche de 0,5 (Vieux Papes, Mouton Cadet) ou de 1 (Malesan, Listel). De plus, le test T de moyenne sur deux échantillons indépendants montre une absence de significativité au seuil de 1 % pour les quatre marques commerciales de vin.

En conséquence, l'hypothèse H3A n'est pas validée.

## Hypothèse H3B (cf. annexe A6)

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La démarche effectuée est la même que celle effectuée pour l'hypothèse H2B et H1. Pour les consommateurs de vin « jeunes », le coefficient de détermination R-deux est significatif (le F de Fisher est élevé, et la signification proche de zéro), sauf pour Malesan (R-deux très faible, pas de significativité).

La comparaison des R-deux entre consommateurs « jeunes » vs « adultes » montre que le R-deux des consommateurs « jeunes » est systématiquement inférieur à celui des « adultes », et ce, pour les quatre marques de vin.

L'hypothèse H3B n'est donc pas validée.

## DISCUSSION DES RÉSULTATS

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Nous avons donc obtenu trois résultats essentiels.

1er résultat: Le noyau central des marques commerciales de vin, issu des représentations sociales, et outil de mesure de l'image de marque, influe de manière significative sur le comportement d'achat des consommateurs. Un tel résultat vient asseoir la crédibilité des marques commerciales de vin.

2<sup>e</sup> résultat: La marque commerciale de vin impacte avant tout de manière positive dans son évaluation et sa dimension incitative à l'achat le consommateur occasionnel de vin, a contrario des experts; un tel résultat confirme les recherches de Amine et Lacoëuilhe (2007), selon laquelle « les marques (commerciales) de vin peuvent constituer un moyen de toucher des segments de consommateur, qui n'ont pas les occasions ou les connaissances pour décoder des signaux de qualité de vin jugés trop complexes ».

En revanche, il semble que les consommateurs réguliers/experts rejettent la marque commerciale de vin comme symbole du marketing, qui souffre dans l'univers du vin d'une représentation biaisée voire négative, notamment auprès des professionnels de la filière vin (Celhay et Trinquecoste, 2008). En effet, les représentations potentiellement négatives pour les quatre marques commerciales (« industriel », « vin marketé », « vin typé grande conso », etc..) proviennent des consommateurs réguliers/experts; ces résultats viennent confirmer en les quantifiant ceux de Passebois-Ducros (2005), pour qui les experts du vin en France perçoivent la marque commerciale de vin comme « standard, résultant d'assemblages, peu complexes, à l'encontre du terroir ».

Le paradoxe de la marque commerciale de vin peut ainsi être expliqué: d'une part, elle séduit les consommateurs occasionnels en quête de repères simples dans l'univers complexe du vin; ainsi, l'augmentation croissante des consommateurs occasionnels en France explique l'accroissement des volumes vendus de la marque commerciale de vin; d'autre part, elle souffre d'un mauvais bouche à l'oreille de la part des relais d'opinion que sont les consommateurs experts, car la logique des vins d'assemblage marketés s'oppose à celle des vins « authentiques » issus d'un terroir.

3<sup>e</sup> résultat: Sur la base de notre recherche, l'âge n'est pas une variable fondamentale influant la perception des marques commerciales de vin (non-validation de l'hypothèse H3A au seuil de 10 %), ni leur dimension incitative à l'achat (non-validation de l'hypothèse H3B): il n'existe pas de différence significative entre les jeunes consommateurs de vin et les consommateurs adultes de vin.

Ceci est cohérent avec le fait que les représentations des jeunes générations ne diffèrent pas sensiblement de celles des adultes (Simonnet-Toussaint, 2006). Ce sont surtout les pratiques de consommation qui ont changé (Amine et Lacoëuilhe, 2007). Les représentations simplifiées des marques commerciales de vin ne rencontreraient pas l'adhésion des jeunes générations.

## Implication théorique et managériale

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Sur un plan purement théorique, la théorie du noyau central de Michel (1999), outil de mesure de l'image de marque via l'étude des représentations sociales, a pu être transférée avec succès à l'univers de la marque commerciale de vin. Le noyau central des marques commerciales de vin possède une dimension prédictive significative avec l'intention d'achat: cela est cohérent avec la « doctrine » de la marque objet des représentations sociales, selon laquelle « les représentations guident les comportements d'achat » (Abric, 1994).

En conclusion, la validité externe de la théorie du noyau central de Géraldine Michel (1999) est une nouvelle fois prouvée.

Sur un plan managérial, la dimension incitative à l'achat de la marque commerciale de vin ouvre des perspectives importantes, qui montre que « la marque commerciale de vin (au sens de vin « marketé ») est en train de s'installer en France<sup>(1)</sup> ». En effet, on assiste singulièrement depuis trois ans en France à des regroupements d'entreprises, permettant le lancement de marques commerciales de vins (Jaillance, Chamarré, Fruité Catalan...) au niveau national et international. Selon l'institut de panel IRI France, les marques commerciales de vin significatives sont en 2007 en France au nombre d'une trentaine, elles réalisent 10 % du CA des vins tranquilles en G.M.S avec une perspective de 15 % à trois ans, et se caractérisent par une montée en gamme autour du seuil psychologique des dix euros. On constate donc une évolution déterminante avec les données déjà citées par Coelho et d'Hauteville (2006), datant de l'année 2004 (une vingtaine de marques commerciales de vin est significative, réalise de 2 à 4 % du CA G.M.S, se concentre sur les segments moyen et bas de gamme).

La marque commerciale de vin possède de fait un certain nombre d'atouts: dans un contexte français de demande déclinante, elle doit permettre, via des représentations simplifiées, de « faire entrer » dans le monde du vin des consommateurs novices ou occasionnels déroutés par la complexité des A.O.C.

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(1): David BOISSIER, directeur général de Listel / group Vranken, Rapport annuel 2006.

Le concept de marque commerciale de vin ne s'oppose pourtant pas au terroir: c'est certainement dans une stratégie de couplage entre marque commerciale et A.O.C que réside une solution d'avenir; Perrouty (2005) a montré que l'interaction marque/appellation se combine différemment suivant les types de consommateur « plus expert » et « moins expert », mais qu'elle apporte dans de nombreux cas de la valeur au produit. « L'appellation est un socle qui permet aux marques de s'exprimer et de se développer ».

## Conclusion, perspectives, limites et voies de Recherche

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La marque commerciale de vin a longtemps souffert en Recherche d'une absence de légitimité: déficit d'image, absence de lien avec le terroir, négation du rôle de la marque. La marque commerciale de vin connaît un paradoxe, car « les Français dédaignent dans les différentes études les marques (commerciales) de vin, mais en achètent de plus en plus » (Viot et Passebois-Ducros, 2005). Une telle assertion met en cause les représentations du vin en France, ainsi que le passage effectif à l'acte d'achat.

En conséquence, notre recherche a tenté de montrer, via la mobilisation de la théorie du noyau central de Michel (1999), que la marque commerciale de vin possède un noyau central (cœur de l'image de marque), qui vient impacter le comportement d'achat. Les résultats exploratoires de notre Recherche semblent montrer la véracité de cette hypothèse sur quatre marques commerciales de vin et sur un échantillon de cent vingt personnes. Au niveau théorique, la validité externe de la théorie du noyau central de Michel est une nouvelle fois prouvée.

La validité prédictive du noyau central est plus forte pour les consommateurs occasionnels que pour les experts: le degré d'expertise est donc une variable déterminante impactant l'évaluation de la marque commerciale de vin. Un tel résultat devrait conduire à la revalorisation du concept de marque commerciale de vin: seule celle-ci, porteuse de représentations accessibles du vin, peut attirer des consommateurs « occasionnels peu impliqués », qui « consentent à boire du vin, mais ne sont pas prêts à s'impliquer dans l'univers du vin » (d'Hauteville et Sirieix, 2008).

L'âge n'apparaît pas comme une variable discriminante dans l'appréciation et l'incitation à l'achat d'une marque commerciale de vin: aucune différence significative entre jeunes consommateurs et consommateurs adultes de vin n'a été constatée.

L'avenir du vin en France passe sans doute par « le développement de la marque commerciale de vin comme indicateur légitime et reconnu, par sa coexistence avec le concept d'appellation d'origine, mais aussi par l'utilisation des grandes régions d'appellations comme marque ombrelle » (d'Hauteville et Sirieix, 2008).

La principale limite de notre recherche réside dans l'utilisation d'un échantillon de convenance de 120 personnes. Les résultats sont donc exploratoires, et nécessiteraient un échantillon plus représentatif de la population française pour être confortés. L'utilisation d'un échantillon composé majoritairement d'étudiants (formation initiale ou continue) explique la profusion des représentations liées aux marques commerciales de vin, ce qui pourrait ne pas être le cas avec l'ensemble de la population. De même, il serait intéressant de différencier l'analyse entre consommateurs réguliers de vin et experts.

Une voie de recherche pourrait être l'étude des stratégies de couplage « Marque commerciale / A.O.C ». L'analyse des interactions et des apports de chacune des logiques de marquage viendrait enrichir le champ spécifique de recherche de l'analyse de la marque dans le cas du vin.

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## Annexes

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- A1) Enquête préliminaire de notoriété sur les marques commerciales de vin, et sélection de quatre marques commerciales de vin
- A2) Force des Associations des quatre marques commerciales de vin
- A3) Sélection des associations centrales/périphériques par la méthode du Chi-deux pour les quatre marques commerciales de vin
- A4) Validation hypothèse H1
- A5) Validation test hypothèse 2A (Conso « Occasionnels » vs « Experts ») et Hypothèse 2B
- A6) Non validation test hypothèse 3A (Conso « Jeunes » vs « Adultes ») et non validation Hypothèse 3B



## A1) Enquête préliminaire de notoriété sur les marques commerciales de vin

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	<b>Notoriété assistée</b>	<b>Notoriété spontanée</b>
<b>Listel</b>	<b>86 %</b>	<b>32 %</b>
<b>Malesan</b>	<b>82 %</b>	<b>29 %</b>
<b>Vieux Papes</b>	<b>82 %</b>	<b>21 %</b>
<b>Mouton Cadet</b>	<b>75 %</b>	<b>21 %</b>
Celliers des Dauphins	50 %	14 %
Castel	50 %	14 %
Baron de Lestac	32 %	11 %
JP Chenet	25 %	11 %
Cambras	25 %	11 %
Fruité Catalan	14 %	11 %

## Sélection des marques commerciales de vin

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<b>Marques commerciales de vin</b>	<b>Catégorie/ Segment</b>	<b>P.V.C 75 cl (hyper)</b>
<b>Vieux Papes</b>	Vin de table	1,50 €
<b>Listel</b>	Vin de pays	2,50 - 3,00 €
<b>Malesan</b>	A.O.C Entrée de gamme	4,50 €
<b>Mouton Cadet</b>	A.O.C Moyen / Haut de gamme	10,20 €

## A2) Force des Associations des quatre marques commerciales de vin

Malesan		Listel		Vieux Papes		Mouton Cadet	
Association	Moy.	Association	Moy.	Association	Moy.	Association	Moy.
Vin rouge	6,67	Rosé	6,86	Rouge	6,81	Bordeaux	6,67
Bordeaux	5,90	Été	6,81	Industriel	6,00	Baron de Rothschild	6,52
Vin typé grande conso	5,81	Sud	6,76	Vin de table	5,86	Classe	6,14
Qualité moyenne	5,73	Frais	6,67	Revenus modestes	5,76	Tradition	6,10
Vin assemb. normé	5,64	Léger	6,57	Bas de gamme	5,71	Haute qualité	6,05
Qualité constante	5,50	Grillade	6,52	Banal	5,71	Valeur sûre	6,05
Sceau rouge	5,41	Vacancier	6,48	Qualité médiocre	5,57	Qualité constante	6,05
Masculin	5,37	Soleil	6,43	Pas cher	5,52	Élégant	5,86
Goût boisé	5,33	Camargue	6,33	Lettres gothiques	5,48	Vin fin	5,86
Industriel	5,27	Mer	6,33	Personnes âgées	5,43	Luxeux	5,86
Convivialité	5,12	Accessible	6,29	Piquette	5,38	Gastronomie	5,86
Tradition	5,11	Convivialité	6,24	Vieillot	5,33	Noble	5,81
Repas familial	4,14	Ciel bleu	5,76	Étiquette jaune	5,29	Patrimoine français	5,81
Peu connaisseur	4,00	Amis	5,52	Rustique	5,24	Distingué	5,71
Quotidien	3,90	Rose pâle	5,52	Non-connaisseur	5,19	Savoir-faire	5,67
Sobre	3,90	Sable	5,52	Saoulerie	5,15	Terroir	5,62
Sans typicité	3,81	Fête	5,49	Vin d'assemblage	5,12	Château Mouton Rothschild	5,57
Festif	3,76	Plaisir	5,45	Sans typicité	5,07	Grand Château	5,57
Sur-vendeur	3,67	Pas connaisseur	5,40	Triste	5,04	Grande occasion	5,48
Confiance	3,62	Vin de soif	5,34	Moine	3,81	Élitiste	5,29
Patrimoine français	3,62	Gris	5,25	Cuisiner	3,81	Experts	5,14
Château	3,43	Industriel	5,16	Trompeur	3,76	Rituel dégustation	5,05
Vin de terroir	3,33	Apéritif	5,12	Déplaisir	3,71	Très cher	5,04
Trompeur	3,24	Universel	5,08	Papes d'Avignon	3,67	Convivialité	4,86
Cheval	3,14	Vin marketé	5,04	Tradition	3,62	A.O.C convenable	4,43
Noblesse	3,00	Liberté	4,52	Génération	3,52	Inaccessible	4,05
Superficiel	2,62	Naturel	4,33	Convivialité	3,43	Vin d'assemblage	3,48
Prestigieux	2,19	Vin d'assemblage	4,24	Religion	3,38	Trompeur	2,86
Luxe	1,62	A.O.C	4,14	Savoir-faire	2,90	Pas connaisseur	2,67
		Savoir-faire	3,95	Authenticité	2,67	Qualité moyenne	2,62
		Chevaux blancs	3,95				
		Élégant	3,67				
		Sans typicité	3,48				
		Pétillant	2,71				

A3) Sélection des associations centrales/périphériques par la méthode du Chi-deux pour les quatre marques commerciales de vin

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MALESAN : Tableau des associations centrales/périphériques

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<b>MALESAN (noyau central = 2 associations)</b>				
	<b>Nb p. 1 à 3</b>	<b>Nb p. 4 à 7</b>	<b>Calcul Chi-deux</b>	<b>Proba Chi-deux</b>
<b>Associations centrales</b>				
Vin rouge	89	31	28,03	0,00
Bordeaux	79	41	12,03	0,00
<b>Associations périphériques</b>				
Sceau rouge	70	50	3,33	0,07
Masculin	66	54	1,20	0,27
Qualité constante	60	60	0,00	1,00
Tradition	59	61	0,03	0,86
Vin type Grande conso	59	61	0,03	0,86
Qualité moyenne	58	62	0,13	0,72
Industriel	58	62	0,13	0,72
Vin d'assemblage normé	56	64	0,53	0,47
Goût boisé	55	65	0,83	0,36
Convivialité	47	73	5,63	0,02

LISTEL: Tableau des associations centrales/périphériques

<b>LISTEL (noyau central = 18 associations)</b>				
	<b>Nb p. 1 à 3</b>	<b>Nb p. 4 à 7</b>	<b>Calcul Chi-deux</b>	<b>Proba Chi-deux</b>
<b>Associations centrales</b>				
Sud	103	17	61,63	0,00
Été	101	19	56,03	0,00
Frais	100	20	53,33	0,00
Rosé	99	21	50,70	0,00
Soleil	94	26	38,53	0,00
Léger	92	28	34,13	0,00
Rose pâle	92	28	34,13	0,00
Gris	91	29	32,03	0,00
Camargue	90	30	30,00	0,00
Sable	88	32	26,13	0,00
Mer	87	33	24,30	0,00
Grillades	84	36	19,20	0,00
Ciel bleu	84	36	19,20	0,00
Plaisir	82	38	16,13	0,00
Amis	82	38	16,13	0,00
Vacancier	81	39	14,70	0,00
Convivialité	76	44	8,53	0,00
Accessible	74	46	6,53	0,01
<b>Associations périphériques</b>				
Fête	72	48	4,80	0,03
Vin de soif	66	54	1,20	0,27
Vin « marketé »	64	56	0,53	0,47
Industriel	60	60	0,00	1,00
Universel	56	64	0,53	0,47
Apéritif	57	63	0,30	0,58
Pas connaisseur	53	67	1,63	0,20

VIEUX PAPES : Tableau des associations centrales/périphériques

<b>VIEUX PAPES (noyau central = 13 associations)</b>				
	<b>Nb p. 1 à 3</b>	<b>Nb p. 4 à 7</b>	<b>Calcul Chi-deux</b>	<b>Proba Chi-deux</b>
<b>Associations centrales</b>				
Qualité médiocre	91	29	32,03	0,00
Vin de table	89	31	28,03	0,00
Rustique	89	31	28,03	0,00
Revenus modestes	88	32	26,13	0,00
Banal	86	34	22,53	0,00
Sans typicité	86	34	22,53	0,00
Bas de gamme	84	36	19,20	0,00
Pas cher	84	36	19,20	0,00
Industriel	81	39	14,70	0,00
Vin d'assemblage	79	41	12,03	0,00
Vieillot	77	43	9,63	0,00
Rouge	77	43	9,63	0,00
Personnes âgées	74	46	6,53	0,01
<b>Associations périphériques</b>				
Non connaisseurs	69	51	2,70	0,10
Triste	69	51	2,70	0,10
Piquette	67	53	1,63	0,20
Sâoulerie	67	53	1,63	0,20
Lettres gothiques	66	54	1,20	0,27
Étiquette jaune	61	59	0,03	0,86

## MOUTON CADET : Tableau des associations centrales/périphériques

<b>MOUTON CADET (noyau central = 23 associations = totalité)</b>				
	<b>Nb p. 1 à 3</b>	<b>Nb p. 4 à 7</b>	<b>Calcul Chi-deux</b>	<b>Proba Chi-deux</b>
<b>Associations centrales</b>				
Tradition	93	27	36,60	0,00
Terroir	93	27	36,30	0,00
Classe	93	27	36,30	0,00
Bordeaux	91	29	32,03	0,00
Haute qualité	90	30	30,00	0,00
Élégant	89	31	28,03	0,00
Baron de Rothschild	87	33	24,30	0,00
Valeur sûre	86	34	22,53	0,00
Patrimoine français	86	34	22,53	0,00
Vin fin	85	35	20,83	0,00
Luxeux	85	35	20,83	0,00
Distingué	84	36	19,20	0,00
Qualité constante	82	38	16,13	0,00
Savoir-faire	81	39	14,70	0,00
Noble	81	39	14,70	0,00
Gastronomie	81	39	14,70	0,00
Experts	80	40	13,33	0,00
Château Mouton Rothschild	80	40	13,33	0,00
Grande occasion	79	41	12,03	0,00
Grand château	77	43	9,63	0,00
Rituel dégustation	76	44	8,53	0,00
Élitiste	76	44	8,53	0,00
Très cher	75	45	7,50	0,01

### A4) Validation hypothèse H1

	<b>R</b>	<b>R-deux</b>	<b>R-deux ajusté</b>	<b>F de Fischer</b>	<b>Signification</b>
<b>Malesan</b>	0,427	<b>0,182</b>	0,168	13,01	0,00
<b>Listel</b>	0,684	<b>0,468</b>	0,373	4,93	0,00
<b>Vieux Papes</b>	0,374	<b>0,140</b>	0,034	2,32	0,02
<b>Mouton Cadet</b>	0,676	<b>0,456</b>	0,326	3,50	0,00

## A5) Validation test hypothèse 2A (Conso « Occasionnels » vs « Experts ») et Hypothèse 2B

Conso. occasionnels de vin vs Conso. réguliers de vin = 60 répondants	Moyenne des évaluations des associations appartenant au noyau central	Hypothèse de variance	Test	Significativité
Malesan conso. occasionnels Malesan conso. réguliers	2,22 <b>3,12</b>	Hypo. variances égales Hypo. variances inégales	- 2,73 - 2,73	0,007 0,007
Listel conso. occasionnels Listel conso. réguliers	2,20 <b>3,00</b>	Hypo. variances égales Hypo. variances inégales	- 3,31 - 3,31	0,001 0,001
VPapes conso. occasionnels VPapes conso. réguliers	2,55 <b>3,24</b>	Hypo. variances égales Hypo. variances inégales	- 2,73 - 2,73	0,007 0,007
M. Cadet conso. occasionnels M. Cadet conso. réguliers	2,37 <b>3,41</b>	Hypo. variances égales Hypo. variances inégales	- 3,7 - 3,7	0,000 0,000

Précision : L'évaluation des associations s'est faite sur une échelle de 1 à 7 points ; si l'association est notée proche de 1 (notation 1, 2, 3), elle fait partie du noyau central. Si l'association est notée proche de 7 (notation 4, 5, 6, 7), elle fait partie du système périphérique. Cela explique l'inversion de l'échelle : ainsi, pour Malesan, les consommateurs occasionnels de vin ont mieux évalué les associations appartenant au noyau central de la marque (évaluation de 2,22 proche de 1) que les consommateurs réguliers de vin (évaluation de 3,12).

## A5) Validation Hypothèse H2B

	Conso. occasionnels R-deux	F de Fischer	Signification	Conso. réguliers R-deux	F de Fischer	Signification
Malesan	0,243	9,166	0,00	0,122	3,950	0,025
Listel	0,705	3,519	0,00	0,315	3,638	0,00
Vieux Papes	0,250	2,179	0,02	0,190	2,829	0,062
Mouton Cadet	0,706	3,759	0,00	0,380	3,321	0,001

A6) Non validation test hypothèse 3A (Conso « Jeunes » vs « Adultes »)  
et non validation Hypothèse 3B

Conso. « jeunes » vin = 60 répondants Conso. « adultes » de vin = 60 répondants	Moyenne des évaluations des associations appartenant au noyau central de chacune des marques de vin	Hypothèse de variance	Test	Significativité
Malesan conso. jeunes Malesan conso. adultes	2,42 <b>2,92</b>	Hypo. variances égales Hypo. variances inégales	- 1,49 - 1,49	0,139 0,139
Listel conso. jeunes Listel conso. adultes	2,65 <b>2,55</b>	Hypo. variances égales Hypo. variances inégales	- 0,39 - 0,39	0,695 0,695
VPapes conso. jeunes VPapes conso. adultes	2,78 <b>3,01</b>	Hypo. variances égales Hypo. variances inégales	- 0,86 - 0,86	0,390 0,390
M. Cadet conso. jeunes M. Cadet conso. adultes	2,65 <b>3,13</b>	Hypo. variances égales Hypo. variances inégales	- 1,62 - 1,62	0,106 0,106

A6) Non validation test Hypothèse 3 B (Conso « Jeunes » vs « Adultes »)

	Conso. <b>jeunes</b> R-deux	F de Fischer	Signification	Conso. <b>adultes</b> R-deux	F de Fischer	Signification
Malesan	0,023	0,67	0,515	0,327	13,84	0,000
Listel	0,522	2,49	0,008	0,698	5,25	0,000
Vieux Papes	0,278	1,36	0,021	0,335	1,78	0,075
Mouton Cadet	0,594	2,28	0,013	0,650	1,91	0,040





# Democratic statecraft versus political legitimacy: The case of Botswana

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## Abstract

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In Africa, Botswana is widely regarded as a frontrunner in democratic politics. But the local political system has been wanting in some aspects. If political legitimacy may be high in “the land of Tswanas”, in many respects political leaders have denied Botswana’s citizens a freedom to shape their political future. To understand the failure of parliamentary institutions in Botswana, we propose to study what Carl Schmitt termed “political decisionism”. Decisionism continues to be relevant to our understanding of the functioning of sovereign state in a country where the political spectrum mainly rests on ethnic and religious affiliations around a strong leader whose legitimacy goes beyond parliamentary criteria.

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# Introduction

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The absence of political violence during elections and smooth transfer of power by the ruling elites in Botswana, in contrast to other African countries has resulted in Botswana being seen as 'the African miracle'. Botswana has enjoyed a stable liberal democracy since independence in 1966 and experienced three peaceful transitions. However, there are growing doubts as to whether Botswana is really the model of democracy (Maundani, 2005).

The First-Past-The-Post electoral system has fared poorly in this regard. It has produced a two-party system with one party dominating the poll. The effective two-party system has made it difficult for smaller political parties, let alone independent candidates, to develop a niche in the political environment. Yet another salient feature is the lack of internal democracy within political parties across the political plain (Mokopakgosi, 2000). The system promotes a predominant party system which undermines the much cherished idea of a multiparty democracy.

But regular free and fair elections do not in themselves mean democracy. Democracy is also about ensuring that electoral outcomes reflect the will of the people through effective parliamentary institutions. To fully understand the failure of parliamentary institutions in Botswana, we propose to study what Carl Schmitt termed "political decisionism". Decisionism seems to have withstood the test of time. Indeed it continues to be relevant to our understanding of the functioning of the sovereign state (Schmitt, 2005: xl) in a country where the political spectrum mainly rests on ethnic and religious affiliations around a strong leader whose legitimacy goes beyond parliamentary criteria.

## 1 - The constitutional frame of decisionism in Botswana

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Carl Schmitt was above all a German jurist and a professor of law before being a political theorist. For Schmitt, the State and the Political presuppose and are defined by conflict (1996: 19). They derive their definition from the friend/enemy distinction which is the specific criterion of the Political because it has the character of ultimate 'oppositions':

"Politics involves friends and enemies, the centrality of those who are with you and those against whom you struggle. Fighting and the possibility of death are necessary for there to be the political." (1996: 35)

Nevertheless, liberalism and capitalism have perverted both the State and the Political. Schmitt sees danger in liberalist democracies where politics rest on a set of mutually agreed procedures and rules. Because it wants to solve and erase conflicts, liberalism evades state and politics. War turns into competitions in the domain of economics and chiefs discussion in the intellectual realm. Discussion ends in a legal and complex frame of laws which strangles the Political. State and politics are then deprived of their specific meaning in order to secure liberty. Liberal society becomes a "huge industrial plant" (2005: 65) where bureaucracy can develop easily.

For Schmitt, such liberal societies can't cope with exceptional situations, *Ausnahmezustand* [state of emergency]. At unpredictable but necessary times "the power of real life breaks through the crust of a mechanism that has become torpid by repetition" (2005: 15). As a professor of law, Schmitt thinks that life can never be reduced or adequately understood by a set of rules, no matter how complex they are. To pretend one can have an ultimate "rule of law" is to set oneself up to be overtaken by events at some unpredictable but necessarily occurring time. Rule must be of men and not of law: *auctoritas non veritas facit legem* as Thomas Hobbes said.

Therefore, if “sovereign power and not truth makes laws”, every government capable of decisive action must include a dictatorial element within its constitution. This state of emergency must free the sovereign from any legal restraints to its power that would normally apply. However, Schmitt differentiates between “commissarial dictatorship” and “sovereign dictatorship”. The former defends the existing constitution and the latter seeks to create the conditions for a new one, given the collapse of the old (2005: xiv). The objective of Schmitt’s sovereignty is to “create a juridical order” (*Recht zu schaffen*) under conditions that threaten anarchy. The sovereign must decide both that a situation is exceptional and what to do about the exception in order to be able to create or recover a judicial order when the existing one is threatened by chaos (2005: xx). This is called decisionism. “Sovereign is he who decides on the exceptional case” (2005: 5). The Sovereign does not only define the “exception”: he is also revealed by and in it.

In *Die Diktatur*, Schmitt devotes the last chapter to Article 48 of the Weimar Constitution in order to consider the capacity of the German sovereign to “handle” this decisive/ definitive moment. In the case of Botswana’s constitution, we should see if its constitution offers an appropriate frame for decisionism.

According to the Constitution of Botswana, one can readily see that decisionism applies well to this country as well. Section 17, chapter II, refers to those situations “relating to emergencies”:

“The President may at any time, by Proclamation published in the Gazette, declare that a state of public emergency exists”<sup>1</sup> Such declaration can cease to have effect in the case of a Parliamentary declaration “at the expiration of a period of seven days”. In any other case, it should cease “at the expiration of a period of twenty one days”. Nonetheless, “a declaration approved by a resolution of the National Assembly (...) shall continue in force until the expiration of a period of six months” (Section 17, (3)).

Conversely, the Constitution does not indicate what constitutes an emergency. This is the assumption that underlay the vote of the Emergency Power Act (Ch.22: 4) (hereinafter referred to as EPA) in September 1966 (Nesereko, 2001). The Act empowers the President, whenever an emergency proclamation is in force, to make regulations ‘as appear to him to be necessary or expedient for securing the public safety, the defence of the Republic, the maintenance of public order and the suppression of mutiny, rebellion and riot, and for maintaining supplies and services essential to the life of the community’ (Section 3, EPA).

In that case, a state of emergency may still be declared even when there does not exist a situation that calls for remedial measures. This assertion is amply supported by the state of emergency that the President declared on 2 September 1999 (General Notice No. 336 of 1999). The only reason why the President made the declaration was to enable him to recall Parliament, which had been dissolved, to amend the Electoral Act to enable about 60,000 voters to be included on the electoral register for the then impending general election. According to the President, “the disenfranchisement of 60,000 voters was unacceptable ... and constituted an emergency situation”<sup>2</sup> (Mmegi: the Reporter, Sept 2-6, 1999). As in Schmitt’s decisionism, an emergency exists in Botswana only when the President says so (Nesereko: 317-318). Then Section 17 of Botswana’s constitution and the Emergency Powers Act seem to let the President act as a true Schmittian sovereign<sup>3</sup> (Section 48, Constitution of Botswana).

<sup>1</sup> Botswana’s constitution is taken from the Commonwealth Legal Information Institute, CommonLII:<http://www.commonlii.org/>

<sup>2</sup> See “Mogae declares state of emergency”, MMEGI: The Reporter (02-06 September 1999), p. 3. The President revoked the declaration he made on 2 September 1999, within less than 7 days after he had made it. See Revocation of the Declaration of Emergency Proclamation, 1999, General Notice 348 of 1999. On the same date he dissolved the parliament after it had passed the necessary amendments to the Electoral Act. See Dissolution of Parliament (No. 2) Proclamation 1999, General Notice No. 349 of 1999. Ref. from Neserko, pp. 318-319

<sup>3</sup> Botswana’s decisionism is also illustrated by Section 48 which gives the President “the supreme command of the armed forces of the Republic”. Section 48: “(1) The supreme command of the armed forces of the Republic shall vest in the President and he shall hold the office of Commander in Chief. (2) The powers conferred on the President (...) shall include— (a) the power to determine the operational use of the armed forces; (b) the power to appoint members of the armed forces, to make appointments on promotion to any office in the armed forces and to dismiss any member of the armed forces. (3) The President may (...) delegate to any member of the armed forces any of the powers mentioned in subsection (2) of this section. (4) Parliament may regulate the exercise of the powers conferred by or under this section.” Commonwealth Legal Information Institute,

An important presidential feature in the Botswana system of Government is the merger of the two executive functions of Head of State and Head of Government into office of the President. This is in contrast with the parliamentary system where the functions of Head of State, usually ceremonial in nature, are performed by a titular figure such as king or queen, while those of Head of Government are performed by a popularly elected politician called the Prime Minister. The other presidential feature in Botswana's system is the way the head of the Executive exercises his/her powers. As in the United States, the President of Botswana is the sole repository of executive power. Unlike his counterpart in Britain or Israel, he does not share that power with anybody, not even with the Cabinet (Part III, Constitution of Botswana).

Three points regarding emergency regulations are worth noting. The first is that the President is given power by way of making regulations to amend or alter existing laws passed by Parliament (Section 3 (2) (d), EPA). The second is that emergency regulations override the provisions of any enactment that may be inconsistent with them. This is so even when the President has not specifically amended or modified those provisions (Section 4, EPA). The third is that the regulations automatically lapse when the emergency proclamation under which they were made also ceases to have effect, unless they are sooner revoked (Section 5 (1) EPA) (Nesereko:320).

For this reason it can be said of Botswana, as did Bernard Tilleman and Andre Alen of the Belgian constitutional system, that: "It would in fact be more appropriate to talk about "division of powers" rather than "separation of powers". Separation of powers only implies that the Legislature, the Executive and Judiciary mainly exercise the tasks which are inherent in their principal function (Blanpain (ed.), 1992: 45).

## 2 - The sovereign as *Volksbewusstsein*

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What is all-important for Schmitt as regards the centrality of the exception for sovereignty is to restore, in a democratic age, the element of transcendence that had been there in the sixteenth and even seventeenth centuries.

"To the conception of God in the seventeenth and eighteenth centuries belongs the idea of his transcendence vis-à-vis the world, just as to that period's philosophy of state belongs the notion of the transcendence of the sovereign vis-à-vis the state." (2005: 48)

The consequence of Schmitt's notion of sovereignty is to try to resurrect in a secular age the qualities of transcendence political authority previously had.

Unfortunately, such transcendence has been lost in our liberal and democratic societies since the eighteenth century and the Enlightenment. "Liberal normativism" made transcendence no longer credible to most educated people in the nineteenth century. And a consequent atheism has begun to prevail since.

"the immanence philosophy (...) draws God into the world and permits law and the state to emanate from the immanence of the objective" (2005: 50).

The triumph of non-political, inhuman technologizing has been inevitable. Indeed, according to the German philosopher, we live in an "age of neutralization and depoliticization". The development of the theory of the state has displayed two characteristic moments: "the elimination of all theistic and transcendental conceptions and the formation of a new concept of legitimacy" (2005: 51). There is thus in Schmitt a challenge to those who would argue that politics in a democratic age can rest on discussion. Such a claim is for him the privilege of the bourgeois "discussing classes" as Tracy B. Strong notes (2005: xxv).

But Schmitt makes a proposal to solve this "onslaught against the political" (2005: 65).

First, political power should be understood on the model of God's creation (2005: xxvii). Power is to make something from that which is not something and thus is not subject to laid-down laws. All law is situational. If "the exception is that which cannot be subsumed", the sovereign's ability to decide "what must be done to eliminate" the exception must have transcendental characteristics. Then the monopoly of political decision-making should derive directly from theology.

"all significant concepts of the modern theory of the state are secularized theological concepts not only because of their historical development – (...) the omnipotent God became the omnipotent lawgiver – but also because of their systematic structure" (2005: 36).

Secondly, the "general will" should not be substituted for the human will of a sovereign (2005: 46). Unlike Rousseau, Schmitt does not believe in the myth of the creative power of the democratically equal populace.

"(...) the necessity by which the people always will what is right is not identical with the rightness that emanated from the commands of the personal sovereign" (2005: 48).

The French revolution was the historically concrete manifestation of this revolutionary fantasy which ended in the Napoleonic era, that is to say in a mere political dictatorship. The democratic notion of legitimacy should not have "replaced the monarchical" (2005: 51). Because "the rationalism of the Enlightenment rejected the exception in every form" (2005: 37), liberal democracies have failed since then to understand and to handle exceptional situations.

Thirdly, Schmitt is, in political matters, a realist as T. B. Strong observed (2005: xxvii). He accepts that legitimacy must be democratic. In fact, Schmitt continues the line of thought initiated by Carl Von Savigny for whom civil law acquired its character from the *Volkbewusstsein* – the common consciousness of the people – and was thus the product of the particular historically given qualities that a people might have. For Savigny, the sovereign or legislator was the expresser of the *Volksbewusstsein* (2005: xxvii).

"the world architect is simultaneously the creator and the legislator, which means the legitimizing authority" (2005: 48).

As a commentator of the Weimar Constitution, Schmitt clearly supported that a presidential election should be decided on the votes of the citizens and not confined to the party that wins the majority of seats in parliament. Indeed, the *Reichspräsident* was directly elected under universal adult suffrage for a seven year term<sup>1</sup>. Therefore, for Schmitt a strong dictatorship could embody the will of the people more effectively than any legislative body, as it can be decisive, whereas parliaments inevitably involve discussion and compromise. In brief, Schmitt promotes no less than a monarchical democracy.

However, in Botswana, under section 32 and 35 of the Constitution, the president is not directly elected by the citizens, but comes from the ruling party. Nevertheless, if Botswana's President lacks legitimacy according to Schmitt's decisionism because he is not popularly elected by the masses (Hansard, 1997), he is more powerful in the National Assembly which is supposed to be the people's representatives. He has the power to dissolve the parliament (Section 90<sup>(2)</sup>). Bills passed by the parliament cannot become law without his consent and his cabinet is part of the National Assembly enabling them to interfere unduly and influence the house (Section 87).

The *Volkbewusstsein* is not just a theoretical concept in Botswana. Since 1966, Botswana has had four different Presidents of the Republic. As an apparent implementation of Schmitt's political ideas, monarchy, theology and power have been linked in Botswana's politics. Originally, the first President of Botswana, Seretse Khama (1921-1980), was the son of Sekgoma Khama II, the paramount chief of the Bamanagwato people (the leading ethnic group in Botswana<sup>2</sup>), and the grandson of Khama III, their King. Seretse became *kgosi* (King) at the age of four. Removed from his chieftainship in 1951 for his inter-racial marriage, he was exiled. He finally returned to Botswana (then called Bechuanaland) in 1956 as a private citizen. Step by step, he leapt back onto the political scene: firstly he founded the nationalist Bechuanaland Democratic Party (1962).

<sup>1</sup> Article 41 to 59 of the Weimar Constitution (Section 3: the President and the Reich). See the official web site (in German): <http://www.lwl.org/westfaelische-geschichte/que/normal/que843.pdf>

<sup>2</sup> See the memorandum addressed to the Resident Commissioner dated 30 December 1965, copy available in National Archives as part of the documentation for the Bechuanaland Independence Conference, 1966.

He became Prime Minister in 1965. In 1966, the constitution he had supervised granted him the Presidency of Botswana<sup>1</sup>.

From then on, all Botswana's Presidents seem to have respected this legacy as they all came from the leading party, the BDP. Furthermore, it seems that they all anticipated the coming of Seretse Khama's son Ian Khama to power. Indeed, the second President, Quett Masire, stepped down and was replaced by the then Vice-President. And the third President, the current one, Festus Mogae, has decided to step down in 2008 in order to let current Vice-President Seretse Ian Khama (born in 1953), to become President of Botswana like his father. From the first to the fourth President, Botswana has been ruled by one party at the top of which there is one royal family: the Khamas.

Therefore, Presidential election in Botswana appears to be just a plebiscite. Section 35 of the Constitution avers that the vice president shall assume office with immediate effect when the incumbent resigns dies or ceases to hold office for any other reason. This provision allows for the automatic succession of the vice-president to the presidency. The practice in Botswana is that the incumbent leaves office a year before his term ends in order to let the vice-president rule (Onkemetse O T, 1994). Indeed, since independence, in Botswana, the President is always the last Vice-President (see table below).

Political Party	Date	President	Date	Vice-President
BDP	From 1966 to 1980 (+)	Sir Seretse Khama	From 1966 to 1980	Dr. Quett Masire
BDP	From 1980 to 1998 re-elected in 1994)	Dr. Quett Masire Joni Masire	From 1980 to 1983 (+) From 1983 to 1992 From 1992 to 1998	Lenyeletse Seretse Peter Mmusi (resigned) Festus Mogae
BDP	From 1998 to 2008	Festus Gontebanye Mogae (re-elected in 2004)	From 1998 to 2008	Ian Khama (son of Seretse K.)
BDP	From 2008 to 20??	Seretse Ian Khama	From 2008 to 20??	??

Elections legitimize the positions of those in possession of power (Kabwegyere, 2000:91). The president is not chosen by the people but by the legislature and the election process of the president in Botswana, therefore, may be considered undemocratic. The choice of the vice president is predetermined before the election within the party lines. The country thus is ruled by unelected persons (Mmegi, Feb. 2008).

Finally, Botswana's decisionism seems to be strengthened by the particular local bicameral system which favors traditional tribal leaders, i.e. local *Volkbewusstsein*.

The Parliament is composed of a National Assembly and a "House of Chiefs". According to Section 58 of the Constitution, the National Assembly has 57 elected members, four specially elected members and the Attorney General. The President is, ex-officio, a member of the National Assembly, and is entitled to speak and to vote in all proceedings of the National Assembly (Section 58). Such a situation is particular since one can hardly imagine that an opposing MP could vote differently from the President.

<sup>1</sup> According to Section 31 of Botswana's constitution: "(1) The first President shall be the person who immediately before 30th September, 1966 holds the office of Prime Minister under the Constitution. (2) The first President shall be deemed to have assumed office at the coming into operation of this Constitution. »  
Commonwealth Legal Information Institute, CommonLII: <http://www.commonlii.org/>

The House of Chiefs has 15 members. While seven members are subject to periodic election, eight are ex-officio members (section 77) due to their position of tribal leaders<sup>1</sup> (Section 78). The House is the successor to the pre-independence Native Advisory Council<sup>2</sup>. It is purely advisory to the National Assembly and to the Executive in matters that directly concern the chiefs, their respective tribes and their administration. It is designed to serve as a forum for heads representing recognised chiefdoms that have historically existed and held territory in Botswana in “their own right”. It is also a means of preserving the cherished institution of chiefs, which is hereditary in character (Nesereko, 2000: 152).

## Conclusion

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We can see, therefore, that Schmitt’s decisionism is obviously applicable to Botswana’s politics. While political decisionism may often lead to violent conflicts, the concept is not inherently evil when applied to Botswana. Nevertheless, even if democratic procedures have not been flaunted in Botswana, in a situation where one political party dominates both the executive and the legislative branches of government, there is cause for concern (Molomo, 2000).

The situation in Botswana may appear paradoxical. Botswana has transformed itself from one of the poorest countries in the world to a middle-income country with a per capita GDP a little inferior to that of South Africa (11,400 USD Vs. 13,300 USD). It has earned the highest sovereign credit rating in Africa and has stockpiled handsome foreign exchange reserves. Nevertheless, what has been a tremendous economical success since independence in 1966 (its economic growth averaged over 9% per year from 1966 to 1999, the highest growth rate on earth) has been accompanied by a gigantic contradiction in the health field.

Botswana is among the countries hardest hit by AIDS. In 2005 there were an estimated 270,000 people living with HIV in a country with a total population below two million. It gives Botswana an adult HIV prevalence rate of 24.1%, the second highest in the world after Swaziland<sup>3</sup>. As a consequence, life expectancy at birth fell from 65 years in 1990-1995 to less than 40 years in 2000-2005, a figure about 28 years lower than it would have been without AIDS<sup>4</sup>.

If decisionism has had much explanatory potential as regards Botswana until now, it seems that local political leaders must handle this major issue if they want to keep alive the “African miracle”. As the Member of Parliament for Gaborone South, Mr. Magama, said, some of Botswana’s democratic institutions and practices have become anachronistic and are in urgent need of reform (The Botswana Gazette, 2008).

<sup>1</sup> They “shall be such persons as are for the time being performing the functions of the office of Chief in respect of the Bakgatla, Bakwena, Bamalete, Bamangwato, Bangwaketse, Barolong, Batawana and Batlokwa tribes, respectively” (Section 78).

<sup>2</sup> Until the onset of British colonisation Botswana did not exist as a single nation. Up until the 19th century the peoples who make up Botswana today lived alongside each other as independent entities. Most of them had chiefs, dikgosi, ruling over them, while others were acephalous. In administering the Protectorate the British left the day-to-day administration of the Protectorate to the chiefs. Thus, it was the chiefs who maintained law and order in their respective areas of jurisdiction and collected taxes on behalf of the administration. The British administration established in 1919 a ‘Native Advisory Council’, later renamed the ‘African Advisory Council’ to advise it on ‘native affairs’. In 1920, the administration set up a European Advisory Council to advise it on matters affecting white people in the Protectorate. These two councils worked side by side and sometimes at cross-purposes until 1950 when a joint body, the Joint Advisory Council, was established.

<sup>3</sup> An earlier UNAIDS estimate of 37.3% prevalence in Botswana is now thought to have been too high. See the UNAIDS / WHO 2006 Report on the global AIDS epidemic.

<sup>4</sup> “The Impact of AIDS”, United Nations, 2004.



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# Towards a Post-Human Distributed Cognition Environment

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## Abstract

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The view of communities of practice as the relevant context for generating and learning knowledge has raised fears that these will fall prey to various organizational, social or political manipulations. The paper wants to question these humanist concerns arguing that knowledge context is increasingly becoming a post-human context that lies beyond the direct control and manipulation by humans. In terms of this post-human position, the paper outlines this shift, suggesting that emergence replaces human intentionality and the dynamic partnership between humans and non-humans, intelligent machines replaces the liberalist, humanist subject's manifest destiny to dominate and control knowledge. The present view wants to raise/rekindle the debate on the prospects of managing knowledge and learning in organizations. Finally, implications for the community-based learning theory are discussed.

## Keywords

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Community of practice; learning and knowledge; social context; post-human knowledge context; distributed cognition environment; emergence.

# 1 - Introduction

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The community of practice perspective (henceforth COP) on learning and knowledge has emerged from a view of truth and knowledge as a thing of this world (Foucault 1991), which is tied to ongoing activities and practices that take place within communities of practices (Brown and Duguid 1990; Wenger 1998; Fox 2000). In these terms, knowledge is claimed to be context-bound, as the upshot of 'social' processes and interactions, rather than the intentional, cognitive work of isolated individuals (Lave and Wenger 1991; Brown and Duguid 1991; Wenger 1998; Gherardi 1999). Learning and knowledge are regarded as «situated»: that is, they always take place in a specific context. The perception that knowledge is a product of context has triggered off theorists' interests in how professional, political, economic and social interests may play a significant role in shaping the form of knowledge to be produced and learned by others. Whereas some theorists understand the social context of knowledge in its narrow, micro sense, involving the local setting of the community of practice (Brown and Duguid 1991; Wenger 1998), and 2), others view it in its larger, macro sense referring to social structures straddling the boundaries of the narrow locality of a given community of practice (Gherardi 1999; Huzzard 2001; Contu and Willmott 2003). On the former understanding (let us refer to it the 'internalist' view), what a community learns is assumed to be shaped by its own internal dynamics, that is, by the locally situated interactions among its members. In other terms, a COP produces its own form of learning (Wenger 1998). On the latter ('externalist') view, the learning of a COP is determined and controlled by outside, social, economic and political forces (Contu and Willmott 2003; Contu and Willmott 2006). The internalist view discards all external constraints, ignoring the immediate and wider contexts: the organization, or the institution in which COPs are nested, the cultural, legal, political, economic, and social settings of which it is a product. In so doing, it falls prey to the critique that although communities and their practices are deliberately isolated from certain influences, they can only exist in relation to an external world and cannot survive without (financial, material and cultural) resources from outside. What a COP learns cannot be self-caused, the outcome of its closed, self-reflexive processes.

Even the claim that the learning of a COP can be explained in terms of 'external', enduring interests that are imposed from above the practice, placing limits to what it learns, can be criticized for regarding contextual interests and constraints as identifiably present in advance, persisting unchanged through practice. Interests and constraints cannot escape the real-time contingencies of the workings of a practice. Nor can they be regarded as temporally non-emergent, as 'unmoved movers, causal principles lying (behind, above)' (Pickering 1995: 64) the learning of practices.

The aim of the paper is to question both of these views and their underlying assumptions that knowledge and learning can be controlled, or causally determined by particular agents' interests or impacted by large-scale structures. The context of knowledge and learning, I will suggest, is neither the outcome of the narrowly defined context, such as that of a community of practice, nor that of a macro context involving large-scale, social and political forces, but is an emergent outcome of a distributed cognition environment consisting of human and non-human elements. Learning and knowledge are emergentist phenomena, non-controllable and unpredictable outcomes of interactions between sets of heterogeneous, social and material agencies. Towards these ends, the paper draws on insights from the sociology of knowledge, actor-network theory and distributed cognition to trace the shift of the context of knowledge from a human to a post-human, distributed cognition environment. The concept of 'post-human' is borrowed from Hayles (1999) in the following senses. In post-human terms humans constitute collections of heterogeneous components, a material-informational entity whose boundaries are not defined, undergoing continuous constructions and reconstructions (Hayes 1999: 3). Knowledge is regarded as an emergent property that arises from the coincidence of a number of complex effects and events. Because subjects cannot be absolutely separated from their environment the assumption that there is an agency, desire, or will belonging to the self and clearly distinguished from the wills of others is challenged; for the post-human's collective heterogeneous quality implies a distributed cognition located in disparate parts in the environment (Hayles 1999). The prefix 'post' in 'post-human' does not entail that humans are free or not free from the wills of others, but what it implies is simply that "there is no a priori way to identify a self-will that can be clearly distinguished from an other-will" (Hayles 1999: 4). In this light, the

prospects for any particular agent or group thereof to control the production and transfer of knowledge and learning are challenged.

The next section (Section Two) makes an overview of how the notion of context in connection with learning and knowing from a practice-based, social perspective has been treated in relevant literatures. Section 3 describes how knowledge context has become a post-human context. Section 4 explores the implications of knowledge as post-humanly constructed for learning and knowing in organizations. Finally, in section 5, conclusions and suggestions for further research are drawn up.

## 2 - What is social about knowledge context?

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On the conventional view of knowledge, scientific inquiry is regarded as a cognitive activity that is de-tached and value-free. Its hallmark is to uncover the structures and processes of nature (Longino 2002) and the aim is to improve our interaction with it (nature) more successfully. In these terms, truth and knowledge of the world are thus given, not assumed to be a matter of contextual features (Haack 1996) such as personal, social or political motives. However, practice-based epistemologists challenge all that, assuming that knowledge is primarily the congruence of a theory with contextual features that are present in the context, rather than the congruence of a theory with an aspect or structure of the world (Longino 2002: 11). The implication is that social interests, that is, features of context, are assumed to lead, or force, a group to produce or accept and learn one theory, rather than another, as knowledge. The argument is that statements cannot be detached from their truth conditions and the context which determines them. This form of contextualism is thus related to the process through which knowledge is justified and warranted. In other words, justification is seen neither as arbitrary nor subjective, but dependent upon features immanent in the very context in which knowledge is produced and accepted as such by the members inhabiting that context. In justifying a belief as true or false, we need to inquire into the causes of its credibility to those who believe it (Barns and Bloor 1982: 22-23). Social interests and political manoeuvrings are invoked to explain the beliefs and the learning of a community. What a certain community learns is designed by certain agents in pursuing some political, social or professional ends. In summarizing this 'interest thesis' developed by the Strong Program, Longino (2002: 17) says that controversies in science are 1) characterized by the social interests attached to the contending positions; 2) settled or 'closed' as a consequence of or in the course of settling the conflict of those interests, usually by the one set having the political resources to attain or retain dominance; and 3) not decidable by an independent set of facts (or by an independent reality). In this sense, it is assumed that knowing as a social activity implies that it is not immune to the power relations with which social activity is saturated (Contu and Willmott 2003; Thompson 2005). For instance, as an illustration, Thompson (2005: 153) observes that "Lave and Wenger's (1991) book implies a recognition of a social order from which the illegitimate is excluded, just as the existence of periphery requires a center".

Of course, COP learning theorists are not the first ones to conjure up the notion of community as the relevant knowledge context and the place for explaining the sociality of knowledge. Peirce (1877), being aware of the fallibility of individual knowers, suggested a definition of truth that emphasizes the community of inquirers. Kuhn's (1962) work has also pointed out the importance of communities of practitioners. Other sociologists have emphasized the notion of laboratory as a specific place where knowledge is produced (Latour and Woolgar 1987). Along with the argument that knowledge is a thing of this world came also the view that the place where knowledge is produced is no different than any other work place, since any work involves practical reasoning in a specific setting (Fleck 1935/1979; Golinski 1998; Longino 2002).

## Knowledge context as narrowly-defined

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However, although practice-based epistemologists agree on the role context plays in the knowledge justification process, they have grappled with the issue of defining the context in relation to which knowledge is to be understood in a variety of ways. Their understandings of context range from disciplines, institutions, peer groups, research teams, and even national and international communities (Golinski 1998: 11). As noted above, theorists working within the COP learning theory have taken two approaches to this issue. Some assume that the relevant learning or knowledge context involves the internal, social interests of the members of the local community. Wenger (1998) considers the sociality of COP in its narrow contextual sense, as a local and emergent one, and not predetermined by large-scale factors. Practices are only shaped by their 'internal', contextual, social, political and professional interests. For him, external contextual factors have little effect on the learning of a COP. For, a COP is defined by its own micro-social context where learning is defined as participation in social practices (Lave and Wenger 1991; Wenger 1998; Handley et al 2006) or as being 'capable of participating with the requisite competence in the complex web of relationships among people and activities' (Gherardi et al: 1999: 274). A community is assumed to have its own situated experience of work, and its own local universe of discourse; being, to a significant degree, self-organizing. Practices are the "property of a kind of community created over time by the sustained pursuit of a shared enterprise" (Wenger 1998: 45). This pursuit of common goals, together with the attendant relationships, leads to a collective experience and learning. On this account, individuals 'learn to function in a community ... acquiring that particular community's subjective viewpoint and learn to speak its language' (Brown and Duguid 1991: 48).

Be that as it may, this narrow definition of context finds its parallel in other theorists working in other disciplines than that of organization learning theory. Most notable is perhaps Collins (1985). In analyzing contemporary experimentation science, Collins made no reference to large-scale social, political forces. The social causes he invoked were related to the contingent judgments and negotiations made among small groups of scientific specialists, or communities. Collins (1985: 142-145) considers informal relations and links among participants of a community occupying the local site of the scientific activity as more relevant than formal institutional ones (Golinski 1998: 29-30). Consistent with Collins' (1985) view is his predecessor Fleck (1896/1961), who also depicted the social profiles of scientists in terms of internal features, arguing that the identify and the cohesion of the group were bound up with their engagement in common tasks and their possession of shared knowledge (Golinski 1998: 29-30). Finally, from the field of philosophy, Nelson (1993) maintains that individuals can only experience the world through socially shared categories, and that their knowledge about that world is filtered to them through the common grids they share with the members of their community. Individuals know only what their communities know and know in virtue of their membership in their communities.

By and large, the narrow view of knowledge context as depicted by the literature above raises a number of issues. The first one has to do with the nature of the social order of a practice, that is, what holds it together and insures its continuation over time. The second one concerns the relation of this narrow context to the larger social context. With regard to the first one, members are claimed to be cognitively shaped through the things they share and possess in common: 1) mutual engagement, 2) a joint enterprise, and 3) a shared repertoire (Wenger 1998: chapter 2). It is possible to question this tendency to emphasize and 'essentialize' the bounds holding members of a community of practice together: 'sharing', 'mutuality', 'commonality', etc (Contu and Willmott 2003; Handley 2006; Roberts 2006). Organized action does not have to be the product of consensus among participants, nor does it have to be the result of sharing a common set of meanings. As Weick (1979) noted, only a minimal shared understanding among members is required, without them having to subscribe to the same goals or share the same interpretations of the joint action.

Rather than assuming that members are necessarily bound together by common cognitive grids (as Nelson 1993 maintains), relationships of mutuality and shared understandings (Lindkvist 2005), or common tasks (as claimed by Collins 1985), they can simply be regarded as relating to one another in terms of interacting. This is the view of Knorr-Cetina (1981), Latour (1987) and Longino (2002), among others who argue that the cognitive dimension of members is not defined as much in terms of what they share



as in terms of their ability to interact (critically). Interactions presuppose diversity of views, beliefs, interests, specializations and tasks. Hence, rather than viewing COPs as necessarily held together by a set of essentialised, substantive beliefs or values shared by their members, they may be considered as emergent communities of practice held together by coincidental links, connections, relations and emergent interactions.

As for the second issue involving the self-organizing and controlling nature of COPs, Thompson (2005), in light of his empirical study, sheds some cloud over the closure of the COPs. He emphasizes the importance of a COP to have sustained 'epistemic interaction with the wider world to prevent suffering from the epistemic inhibitions of its own paradigm. A COP may run the risk of closing itself off to external concerns, becoming increasingly unable to see things the way others did (Thompson 2005: 163). In many respects, the claim that COPs are self-organizing and immune to external influence is not persuasive. Wenger (1998) assumption that a COP can never be "fully determined by an outside mandate, by a prescription or by any participant" (1998: 80) cannot be upheld. Likewise, Wenger insists that even when a community's response to external pressures complies with the needs of a specific external demand, it is the community – not the mandate – that produces the response. Wenger's language is redolent with the autopoietic theoretical-approach developed by Maturana and Varela (1980). The gist of this theory is based on a view of the world as a set of informational organisms. Such organisms or systems respond to their environment in ways that are determined by their internal self-organizing structures. Their ultimate aim is to reproduce the organization that defines them as systems. Systems are not only self-organizing but also self-making. There is no direct intervention from the external world; for information does not cross the boundary separating COPs from their environment. All the environment does is trigger off changes determined by the system's internal, structural properties.

One of the contributions of the idea of self-organizing is to cast a cloud over the Durkeimian (structural) social system view in terms of which entities possess stable contours, suggesting instead that these are the emergent effects of mutual interactivity. On the negative side, the logic of self-organizing in terms of which systems are presumed to continually produce and reproduce themselves in a self-reflexive, circular way turned out to be not very persuasive (Hayles 1999). For, if no information or input crosses the system, there is no feedback loop – the loop that is meant to connect a system to its environment. Systems are neither closed nor doomed to evolve in predetermined fashions. They are dependent upon external sources for their input and their output.

Furthermore, systems and their components may evolve in ways that are not anticipated. In other words, they may spontaneously generate unexpected (emergent) properties. The upshot of such criticism is an understanding of self-organizing not merely as the (re)production of internal organization but as the springboard for emergence of features or properties that evolve spontaneously in unanticipated directions (Hayles 1999: 11).

### Extending the boundaries of knowledge context

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This preference for an innocent, self-reflexive localization of the context of knowledge and learning, freed from external constraints and where the social is understood in terms of the internal interests of members of the local community, was found suspect by, among others. For Contu and Willmott (2003), learning and knowledge are not internal matters of the narrowly-defined social context but those of large-scale forces and structures. Rejecting the absence of constraints, these authors ascertain that the learning and knowledge of a COP are determined and controlled by outside, social, economic and political forces. The context, they argue, does not only consist of the immediate background of participants' interactions, but also of a complex of wider social relations, for communities and practices, they claim, "develop and are (also) reproduced within a wider nexus of politico-economic relationships and institutions" (p. 285). This is consistent with Thompson's (2005) position that a community should keep abreast of, and relevant to the wider perspectives and the wider market, because "ultimately it is usually the wider society that sustains such communities, in both epistemic and structural terms".

Contu and Willmott (2003) take seriously Lave and Wenger's (1991) critical stance that emphasizes the importance of social relations, or more specifically, power relations and identity formation for understanding knowledge and learning in COPs, assuming that 'hegemony over resources for learning and alienation from full participation are inherent in the shaping of the legitimacy and peripherality of participation in its historical realizations' (Lave and Wenger 1991: 42). Contu and Willmott (2003; 285) suggest that learning occurs as 'individuals become members of the communities, in which they are acculturated as they participate actively in the diffusion, reproduction, and transformation of knowledge-in-practice about agents, activities and artefacts. They complain that in previous accounts 'little consideration is given to the wider conditions – historical, cultural, and social – that make possible the existence of what Orr so richly reports – that is, the technicians' reluctance to exchange machines, their delight in troubleshooting, and their receipt of psychological rewards from customers' (290).

The authors are critical of Brown and Duguid's (1991) account of 'organizations as collections of communities of practice', regarding their work as 'a cleansing of historical and societal coordinates from examination of (situated) learning as a process of social interaction, meaning, and identity reproduction. The organizational context of learning is conceptualized in terms of a transparent background rather than a contested history', say Contu and Willmott (2003: 293). The authors were particularly concerned with 'management's strategies to control and direct the recalcitrant tendency of technicians to do it [their job] their way and to improvise when faced with a malfunctioning machine' (ibid. 290). They also lament that commentators have unheeded the link between the daily discourse of the technicians and the capitalist relations of employment in which the technicians struggled to execute their work' (ibid. 290). According to the authors, by providing the technicians a set of 'directive procedures, the company aspired to short-circuit the deployment of skill and discretion, and thereby raise their productivity damaging exercise of initiative' (291).

Referring to Lave and Wenger's (1991: 42) they point out that 'participation in work practices is shaped by hegemony over resources for learning and alienation. Contu and Willmott (2003: 291) add that 'the imposition of management control – so that when procedures are slavishly followed opportunities for learning and developing the capacity to fix machines are denied – suggests the relevance of incorporating concepts of contradiction, ideology (managerial as well as other employees'), and conflict into analyses of situated learning'. Contu and Willmott (2003: 294) conclude by making a plea for analyses of learning in organization that 'more fully appreciate and demonstrate how learning processes are inextricably implicated in the social reproduction of wider institutional structures'.

The rhetoric underlying the issues raised by Contu and Willmott (2003) is a familiar one, and finds its highest articulation in the classical study by Noble (1984), which involves a story of the implementation of numerically controlled machine tools in a workplace. In analyzing the twists and turns in the roles and relations attendant upon the introduction of the system, Noble uses the repertoire of interests, focusing on management as inherently characterized with two main interests: interest in making profit and an interest in dominating the workers, insisting that the latter is the really important one. Notice that Contu and Willmott (2003) are in support of this assumption, to this way of imputing enduring and stable attributes to managers' attempts to dominate workers.

The idea that knowledge context goes beyond the plane of practice is also at the heart of studies of the members of the Strong Program. Shapin (1982), for instance, rejects the 'internalist' view that science is shaped only by issues arising within the practice, narrowly defined as purely cognitive activities. As an illustration of the impact of (external) political interests on science, Shapin and Schaffer (1985) account for the dispute between Robert Boyle and Thomas Hobbes regarding the probative value of experiment. While Boyle advocated experimentation as a viable scientific method, Hobbes favored the Euclidean style of geometric demonstration, ascribing cognitive authority to deduction from universal principles, which are themselves beyond questioning. Shapin and Schaffer situate the debate in its larger historical context: the English Civil Wars, linking this epistemological issue to the different approaches to how to resolve the problem of the social order. Hobbes' attempts to eliminate diversity of opinions were meant to be part of the solution to the prevailing social unrest. Nevertheless, experimentation was subsequently accepted as the method of obtaining knowledge about the world, not because it was superior but simply because

it was coincidental upon the emergence of parliamentary form of political life which was to prevail. This example illustrates the parallel between conceptions of (social) political authority and (local) cognitive authority (Longino 2002).

Although the Strong Program studies constitute a first step to resolve the micro-macro divide – by locating the knowledge context in its larger environment of which it is a product – they worked within a Durkeimian, non-emergent, stable and enduring sets of attributes of context. In other terms, some properties associated with individuals or structures of the social context are presumed to persist through the passage of a practice. The language of interests and other categories fall within the purview of a classical social-theoretical approach which undermines the locally and temporally situated nature of practice. If interests and goals there will be, they should be understood within the plane of practice (Pickering 1995: 172), they do not control practice from without (Ibid. 203) but emerge in the practice itself. The continually emergent nature of context makes it impossible to relate knowledge to any substantive variable. This emergentist view of context will be amplified within the framework of what has come to be referred to as laboratory studies amplified in the next section.

### Laboratory: Imploding the boundary of knowledge contexts

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In an attempt to address the shortcomings beguiling the relation between the micro and macro conceptions of knowledge context, on the one hand, and the nature of interests and constraints, on the other, Fox (2000), writing in a Latourian spirit, rejects “the existence of either an objective socio-historical context, or the existence of macro-actors on that stage” (p. 858). Writing in the shadows of Knorr-Cetina and Latour, Fox suggests that the process of generating knowledge is not to be constrained by any particular interest or force, but rather it is the outcome of interactions among a set of heterogeneous actants entangled in a network. As noted above, in this knowledge context, all the traditional (theoretical) categories, such as “nature”, “culture”, “society”, “organization”, etc, are not taken for granted, for these are constantly defined and redefined by actants in processes of negotiation and translation. It is in this connection that Fox (2000) acclaims Brown and Duguid’s (1991: 49) “contention that “the canonical organization becomes a questionable unit of analysis (Fox 2000: 858), arguing that as a formally well-bounded entity, organization “does not exist by theoretical fiat, but only by nests of practices reproduced and emergent within COPs” (Fox 2000: 858).

As noted above, Fox (2000) is inspired by Latour and the so-called laboratory studies within the sociology of knowledge stream of thought. Underlying this school of thought is the metaphor of the laboratory which has come to be regarded as the context for producing knowledge (Golinski 1998: 30). Laboratory is meant to transcend the micro-macro schism and at the same time remaining committed to an emergentist approach (Knorr-Cetina 1981; Latour and Woolgar 1986) to interests and constraints. For instance, in *The Manufacture of Knowledge* (1981), Knorr-Cetina shows how the discursive community of science extended beyond the borders of the laboratory to include, commercial funders, universities, users, and so on. Knorr-Cetina (1981) traces a paper from its beginning in the laboratory, through its fifteen drafts as the authors responded to comments and suggestions by internal and external peer reviews. She highlights how during this process of publishing the paper, contextual factors of the scientists are progressively altered or eliminated. The article is carefully positioned in specific relation to other previous works via the pattern of citations. In response to reviewers’ comments and suggestions, the article is rewritten so as to give the impression that the problem, not the researchers, determined the tools, the results, not the researchers, determined or suggested the conclusions (Longino 2002). The result is thus a piece of work that is de-contextualized, that is, cleansed of its traces, its origins and its contextual aspects such as the professional and political interests that initially propelled the authors’ writing of the article. The gist of this is that the article has been relocated from the very local context of the group and its laboratory to the broader context of accepted public knowledge through two processes: one of de-contextualization (by eliminating elements of the narrow context) and one of re-contextualization (by incorporating features associated with the larger context). As a product, thus, the article is the sum of both internal and external inputs.

A second example of laboratory as a knowledge context is Latour (1988) who problematizes not only the inside-outside, macro-micro distinction but also the relation between the knowledge produced and context. In doing so, Latour (1988) advocates a simple approach, namely 'following' what practitioners of science and technology do, as they manipulate material, social, and linguistic entities. His argument is that the practices in which scientists and technologists are engaged reconfigure the social world at the same time as they create knowledge about it. Underlying this Latourian approach is an assumption that, as 'actants' produce and learn new knowledge, they transform the world (or the context) knowledge is about. This is captured in Latour's (1993) 'Give Me a Laboratory and I Will Raise the World'. For him, scientific experiments produce the nature whose existence they presuppose (1987). There is no outside acting on an outside, or inside acting on an outside. Rather, there is traffic between specific sites. In this traffic, elements of the one are brought to the other – a process of displacements and translation - translation not only of concepts, but also of interests.

As an illustration is Latour's interpretation of Pasteur's accomplishment in the 19th century, where he (1988) argues that Pasteur's work did not only establish the germ theory of disease but also transformed agriculture and veterinary and human medicine by microbiology. And rather than understanding Pasteur's work in terms of pre-given and stable interests and a fixed context, Latour suggests that we focus on a series of displacements and translation. According to Latour, Pasteur first takes his technicians out to the field where they collect infected matters and establish identities between field entities and laboratory entities. Hence, the farmer's infected field becomes part of the laboratory – at least for some period of time. Pasteur brings back and recreates only selected portions of the farm conditions in the laboratory. Specifically, he can create an outbreak of anthrax. Applying what he had learned from work with chicken cholera about variations in virulence, he is in a position to regulate the weakness or strength of the microbe thus ultimately to create a vaccine (Longino 2002). The effectiveness of the vaccine is not demonstrated simply by shipping vials of it from the laboratory to veterinarians, saying 'try this'. Instead the laboratory conditions that support the vaccine's effectiveness in the lab must be recreated in the field – that is, the laboratory must be extended to the farm (ibid.).

On this count, there is traffic between the laboratory and the farm – a traffic that consists of a series of displacements and translation. The interests of the French farmers' economic success are translated into interests in the success of the experiments in Pasteur's laboratory, and thus into interests in its maintenance and support. In this way, the interests of Pasteur and those of the farmers are fused. The vaccine, as an artifact is the reified learning of both communities.

Hence, for Latour, in contrast to Contu and Willmott (2003), the laboratory is not a place where pre-existent social forces interact, and stable interests prevail, but a place where new forces are created and where the social context (in its micro and macro senses) is transformed. On the reading of the actor-network theory Latour is advocating, sociality (such as social interests) is just an outcome of the complex process of displacements and translation. Social interests are produced in interaction. Pasteur's anthrax bacillus both does and does not pre-exist Pasteur's attempts to isolate it (Longino 2002: 36). In this performative idiom, learning and knowing have come to be couched in terms of 'growth', 'action' and 'changes' in ways of working (Fox 2000). The motto of this approach is to 'follow scientists and engineers through society' (Latour 1987, emphasis added), rather than explaining why they are doing what they are doing.

Another implication of Latour's framework is that learning (as defined in the sense of action and growth) is not only regarded as the preserve of human but also of non-human actants. Latour's symmetry relation between humans and non-humans rests on the assumption that these two actants are regarded as semiotic, disembodied artifacts, as semiotic 'actants'. What makes such assumptions plausible?

### 3 - Post-human distributed cognition environment

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This postmodern/linguistic turn to conceptualizing the body in terms of immaterial, discursive constructions is not new. Already in the fifties, the cybernetician Wiener attempted to equating humans and machines (Hayles 1999: 64). As a representative of the first-wave cybernetics, Wiener defiantly conceived of the human boundaries as constructed rather than naturally defined or given. It was at that time that cybernetics set up reconfiguring the human body by constructing it as an information processing system whose boundaries are determined by the flows of information. This assumption was brought home by Bateson's (1972) question whether a blind man's cane is part of his body. Given that cybernetic systems are constituted by flows of information between a system and its environment, Bateson argues that cane and man join in forming a single informational system: the cane conveys to the man crucial information about the environment, without which the man would not be able to interact successfully. This is true of hearing aids for a person with impaired hearing, glasses for a short-sighted person, etc. Of course, when the list of artifacts, machines and cybernetic, technological devices is extended from those that correct or compensate for a bodily deficiency to include those that enhance or amplify bodily functions, it becomes difficult where to draw the lines between body and machine. Thus following, Bateson (1972: 251, quoted in Hayles 1999: 304. Note 1), "it is not communicationally meaningful to ask whether the blind man's stick or the scientist's microscope are 'parts' of the men who use them. Both stick and microscope are important pathways of communication and, as such, are part of the network in which we are interested; but no boundary line – e.g. halfway up the stick – can be relevant in a description of the topology of this net".

Given the difficulty in separating human from non-human realms, and given the salience of artifacts populating this context it does not anymore make sense to speak of a 'social' context. This is why the term 'social' used by Latour and Woolgar in their (1979) *Laboratory Life: The Social Construction of Scientific Facts*, was dropped from the subtitle of the 1986 second edition. On Latour's reading, what constitutes the context of knowledge is a set of performative, material processes, where telos, constraints, interests, identity, race, etc, count little since what emerges from these processes is coincidental, unpredictable, and uncontrollable.

This symmetry between humans and non-humans implies that the knowledge context that once was described as 'social' has evolved into a post-human, emergent context. Learning and knowing which were considered to involve human interests have now come to be shaped by non-humans as well. This is a far cry from the context envisaged by COP learning theorists who viewed knowledge and learning as caused by internal matters to the community, or by members of the Strong program, who regarded such processes as caused or controlled by a non-emergent set of macro-social interests and forces located beyond the immediate context of participants. To be noted is, however, the point that both of these schools of thought regarded learning as human-specific attributes – an assumption that explains why humans are obsessed with the idea of controlling the knowing and learning of others and the invocation by researchers into COP of relations of power in explaining the learning of those communities. As we shall see in the next section, the post-human context for knowledge and learning poses a challenge to the assumptions that knowledge and learning are attributes of human agencies, and that learning is amenable to control and manipulation by humans alone.

To sum up this section, one of the main contributions of laboratory studies is the blurring of the inside-outside boundaries and their commitment to an emergentist approach that de-stabilizes the context that was thought to produce knowledge (involving conventional categories such as interests, organization, society, culture, etc), stressing instead its coincidental emergence through practices. Also crucial is its emphasis on an emergent performativity, which explicitly recognizes the significant role of material agencies, and which re-enforces one of the most crucial tenets of the practice-based epistemology, namely that knowledge is something to be done, rather than a matter pertaining to mental representations and manipulations of abstract symbols. Because of the emphasis on issues of identity formation and social (power) relations permeating extant COP theorizations, artifacts and the physicality of the knowledge environment have

vanished from the radar screen. As a result, the significance for learning and knowledge of material agency and the physical features of the environment of COPs have not had an adequate treatment beyond the mere recognition that artifacts and tools play an important role in the activities and lives of COPs. Furthermore, Latour's contribution can be regarded as a remedy to extant literature's neglect of the role of non-humans in COPs. However, one of the weaknesses of Latour's framework is its resort to semiotics in constructing the human body. In spite of its emphasis on materiality and physicality, it has fallen prey to the post-structural, linguistic ethos. Viewing humans and non-human as actants, as semiotic constructs does not seem to go down easily within a practice-driven, material agency (Pickering 1994).

In an attempt to go beyond laboratory studies theorists have developed 'distributed cognition environment' as a more viable alternative for studying situated cognition claiming that such studies have 'ecological validity'. Ecological validity studies focus on activities that take place in real, everyday situations, rather than in the laboratory. In such environments, cognition is viewed as extended into the environment surrounding us, and cognitive activities are regarded as embodied and situated within the work settings in which they occur and in which a diversity of technological artifacts and other tools are an indispensable part. Hence, one of the main premises of the distributed environment is that it extends human boundaries into the environment. Human knowledge and cognition are not confined to the boundaries of the individual, rather, they are distributed in the sense that memories, facts, or knowledge are placed in objects, individuals, tools and structures featuring an environment. In such an environment, cognition is distributed between human bodies and minds, artifacts and environment. One such instance of distributed cognition environment is Hutchins (1995). In his study of the navigational systems of oceangoing ships, Hutchins (1995) shows that the cognitive system responsible for locating the ship in space and navigating it successfully does not reside in humans alone, but in the complex interactions within an environment populated with both human and non-human actors. The focus is on the interactions and relations between individuals and artifacts and how these contribute to the environment in which the work activity takes place: the representational media (e.g. instruments, displays, manuals, navigation charts), the interactions of individuals with each other and their interactional use of artifacts. Hutchins and Klausen (1996) emphasize how cognitive activities are embodied and situated within complex, socially distributed work activities of which a diversity of technological artifacts and other tools are integral components.

In a distributed cognition environment, not only artifacts and tools are regarded as crucial highlights of knowledge contexts, but also the very physical structure of the environment has come to be regarded as a store of potential intelligence for the actors situated in it. In a sense, the human body is regarded as integrated into the environment, with its consciousness extending into it, rather than contained within coherently-bounded boundaries. In this way, the physical environment is made into a support for knowledge and learning (Hutchins 1995; Kirsh 1996; Clark 1997; Susi & Ziemke, 2001; Heylighen et al 2004). The environment is deployed as a storehouse, as an external memory and body, in which information about daily activities is stored for guiding future activities. This is evident in ants' laying of pheromone trails, in wood mice's use of branches to mark foraging places, or the mound building of termites, etc. This process can be described as an "offloading" of information onto the environment which makes this information potentially available for other agents, thus providing a medium by which information sharing, communication, and coordination can occur (Heylighen et al 2004). It is this idea of actively externalizing, or displacing knowledge into the environment by building in this environment structures that may inform future activities that has come to be referred to as distributed cognition (Hutchins 1995).

The integration of the body and mind, or their extension into the environment is only possible if we view the boundaries of human agents as malleable, shifting and extendable. Indeed, from this perspective, there is no core self, rather individuals can be seen to grow into the world. Individual consciousness becomes distributed, for cognition does not flow from one center towards a periphery, rather it becomes a distributed cognition among the different nodes involved in a network of interacting technologies, environmental structures and minds-bodies configurations. In other words, there is no need for a central executive from which meaning and knowledge flow. Rather, cognition is integrated into the environment, and at the same time emerging from it (Hayles 1999).

## 4 - Concluding remarks and implications

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What are we to make of this knowledge context? Can individual interests and social constraints still be assumed to have an impact on what knowledge is to be generated and disseminated within a given practice? What are the prospects for controlling or managing knowledge and learning in this context? One path into these questions is to explore how the subject of knowledge is constructed by these different views of knowledge context. At the outset of the paper, it was noticed that the view that knowledge is a social construction triggered off fear that knowledge will fall prey to dominant agents' social interests and manipulations. The different views of what is meant by 'social', as chronicled in this paper, shed light on what assumptions may authorize such fears. It is only if we envision the human subject as a self-contained, coherently-bounded individual, autonomous self and separated from the environment can such fears have a meaning (as viewed by Lave and Wenger (1991), Gherardi (1999), and Contu and Willmott's (2003)). It is only when we conceive of the knowledge context as a human-centered environment that such fears can be excused. And it is only when we regard consciousness as the essence of human identity, the source of meaning and fountain of knowledge can such fear find justification. On Wenger's view of COPs as decentralized and self-regulated contexts individuals are envisioned as autonomous entities whose learning process will take the shape of a trip from a peripheral to a central position in the community. During this same process, individuals would undergo an identity transformation, from non-member, to marginal, and finally to fully-fledged members. Though situated and surrounded by artifacts and tools, learning and knowledge remain largely an affair between talking and interacting humans. The underlying assumption is that knowledge and skills are mainly located in the old-timers' minds and bodies. Although internal struggles concerning control of knowledge and skills may arise, the COP as a unit, according to Wenger (1998), is beyond the control and intervention by external agency. Learning can be defined as a system's response to a triggering event in the surrounding environment, emerging from the recursive operations of a system representing to itself its own representation.

Moving to the second perspective (Contu and Willmott 2003; and the Strong Program), the context of knowledge is enlarged beyond the narrow confines of the local place to include society at large. Here relations of power are invoked as causes or sources of learning of those COPs. Of course, this stage is still a humanist one, but, in contrast to the previous one, is punctuated by conflicts of interests. Such interests are assumed to be intrinsic features of individuals (such as managers) or large-scale social forces (such as economic, political systems), which causally determine what kind of knowledge to be developed and diffused. Most of all, learning is depicted as something that is amenable to manipulation by certain groups. If learning is assumed to be controllable, that means that its source is identifiable. In an empirical study, Thompson (2005) does not find support for the claim that management can intervene in the learning of a community. According to his study, attempts to directly control group interaction by introducing too much structure may lead to the demise of the community itself. According to the same study, structures that are introduced with a view to indirectly seeding future collaborations are likely to work, because these provide people with the 'monuments, instruments, and points of focus that are required as a basis for communicative interaction' (125-128). On the contrary, imposing structures that attempt at determine or directly controlling present collaboration is likely to fail. The distinction between controlling and seeding structures represents the emergent dynamics of COP in which people require preexistent raw materials to communicate (seeking structures) but the way in which such resources are used by individuals and interact around them is always subject to negotiation, and thus not amenable to control (Thompson 2005: 162).

Thompson's (2005) framework addresses some of the deficiencies associated with the internalist and externalist approaches to the knowledge context. First, it recognizes the self-organizing nature of COPs, though this self-organizing refers to an open system. Second, it recognizes the existence of external constraints that may be articulated in the form of seeding or controlling structures. Whereas it is easy to define the structures, it is not possible to predict the communicative interactions (and the resulting epistemic consequences) that may arise from these structures. Third, such constraints do not have a deterministically causal effect on the dynamics of a COP, given that it is not possible to conjure up the emergent duality that constitutes any COP (Thompson 2005).

However, Thompson's framework suffers from a focus on the knowledge-context as an environment that is predominantly subject-centric and humanist in nature. By the same token, it reduces knowing and learning to features of communicative interactions among individuals. By contrast, in the post-human view of knowledge context, as suggested in the present paper, the subject is not the only source or locus of knowledge. Knowing and learning are outcome of interactions among individuals, artifacts and the structures in the environment; they are uncontrollable and unpredictable. They are not concentrated in a center that can manipulate and distribute them at will. Furthermore, learning and knowledge cannot be known in advance (Tsoukas 1996). They emerge contingently from the connections among humans, artifacts and their environment. In this context: "the very illusion of control bespeaks of a fundamental ignorance about the nature of the emergent processes through which consciousness, the organism, and the environment are constituted. Mastery through the exercise of autonomous wills is merely the story consciousness tells itself to explain results that actually come about through chaotic dynamics and emergent structures" (Hayles 1999: 288). Subjectivity is not located in consciousness but emergent from networks that are 'materially real, socially regulated, and discursively constructed' (Latour 1993). Hence, in a post-human context, emergence replaces teleology, distributed cognition replaces autonomous will, the dynamic partnership between humans and non-humans and intelligent machines replace the liberalist humanist subject's manifest destiny to dominate and control nature (Ibid.).

## Implications

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In describing Orr's (1990a; 1990b) works, Yanow (2006: 153) says that it is 'a humanist approach that seeks to re-ground work and workplace studies in the details of what workers – we – actually do, not out of a methodological impulse alone, but out of an appreciation for those things that make us, all of us, human'. Now what does a post-human perspective imply for this overly humanist basis underpinning extant COP learning theory? What resources does it provide for us to rethink the COP learning theory? The post-human approach may invite us to rethink, or to expand our view of the dynamics of learning in COPs in many respects. For one thing, although many of a COP's activities are mediated by a wide range of technological artifacts found in the environment of a workplace and in the features highlighting it, learning from, with and about artifacts has been a blind spot in the COP literature. In the main, this has been a human-to-human matter. When artifacts are invoked they are merely regarded as things to be 'talked about' (as obvious in Orr's (1990a) title: Talking about Machines), to be mended or used passively, but hardly as learning aids, as things that make us smart (Norman, 1993), or as part of a large distributed cognition environment.

For another, COP learning theory is crippled by its human-centered approach to learning, and its concerns with issues of identity formation. The conception of learning as proceeding along a trajectory toward a known end becomes problematic in an emergentist context, where learning is conceived as evolving toward an open future marked by contingency and unpredictability. If learning is an emergent feature among humans and non-humans and an environment, it cannot then be fully determined in-advance by the wishes, fears or interests of any one individual. There is no ultimate standpoint which orders and legitimates the learning of communities. This insight has not gone unnoticed within the research community. As noted above, Tsoukas (1996) raised this issue insisting that nobody knows in advance what knowledge will be relevant. Learning cannot be subsumed under the control of management, therefore, difficult to conceive in terms of a means-end logic, or utilitarian calculus. Gherardi (1999) and Huzzard (2001) also questioned the conventional view holding that learning can be intentional, normatively sustained. It would follow from this that it is difficult to conceive of a 'one best way of learning', as Hubert (1991: 88-89) rightly put it: 'we need to challenge the narrow concept of organizational learning, referring to the prominence of the instrumental approach in managerial perspectives. The emergentist approach spells disaster for such an instrumental view as propounded by theorists working within the much-vaunted area going under the label of 'knowledge management'.



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# A framework for an integrated distribution system optimization model

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## Abstract

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This paper presents a framework for an integrated optimization model of supply chain functions in a multi-plant, multi-product, multi-customer supply chain with deterministic demands. A mixed-binary integer programming model is proposed to integrate the capacitated location, production, and distribution (CLPD) functions within a supply chain. The integrated CLPD problem is formulated as a profit maximization model with capacity and demand constraints. The result is a framework from which to design entire supply chains from suppliers to customers. The proposed model is solved using OPL Studio 3.7 and solutions for four variations of the CLPD problem are presented to demonstrate the efficacy of the integrated approach. The main contribution of this research is a multi-echelon, supply chain design and modeling hierarchy. This study was motivated by a perceived gap in the literature on supply chain modeling methods and supply chain frameworks.

## Reference

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## Keywords

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Distribution systems design, capacitated location, facility location.

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## 1 - Introduction

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Decisions can be made across supply chains at three hierarchical levels: strategic, tactical and operational referring to long term, mid-term and short-term decisions. Different supply chain functions are embedded at each of these three levels. Ganeshan and Harrison (1995) classify these functions into the four categories of location, production, inventory, and transportation. These four supply chain functions are integral to the optimization of overall supply chain performance. Hence, it becomes imperative to execute each one of them in an optimal manner to ensure an efficient supply chain. For the most part, these four functions have been studied independently of each other leading to globally sub-optimal decisions (Fawcett and Magnan, 2002).

More recently, an integrated approach to analyze these functions simultaneously and to study their impacts on supply chain performance has been proposed (Erenguc et al., 1999, and Kaur et al., 2006). Supply chain integration herein refers to the use of a methodology aimed at a more holistic analysis of the supply chain functions that also incorporates the interaction effects between these functions for determining a globally optimal solution.

In measuring a particular supply chain's performance (see, for example, Beamon, 1999, Gunasekaran et al., 2004, Hofmann and Reiner, 2006, Vanteddu et al., 2006, and the review of supply chain performance metric research by Gunasekaran and Kobu, 2007), one can apply many different metrics. Some of the more commonly used metrics are profitability, total revenues, costs, return on investments, response times, market share, quality, customer satisfaction, risk minimization, waste reduction, etc. With an integrated approach, it is necessary that the performance metrics chosen are uniform for all partners across the supply chain.

### 1 - The need to integrate

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It has been noted in the literature that very few attempts have been made at supply chain integration (e.g., Maloni and Benton, 1997, and ReVelle and Laporte, 1996). Yet, several have cited that supply chain integration is a valuable source of competitive advantage (Vidal and Goetschalckx, 1997, Graves, et al., 1998, and in detail in chapter thirteen of Chopra and Meindl, 2004) in today's increasingly global marketplace. In those few efforts that have attempted supply chain integration, it has generally been a result of instantiation specific, piecemeal improvements, rather than from an overall implementation of globally optimal strategies (Lee, 2002, Brown et al., 2001, Gupta, et al., 2002,). Traditionally, the different echelons of the supply chain and also the different decisions have been considered separately for ease of planning purposes. Although this makes them much easier to solve, it does not consider their interrelationships. As the manufacturing environment becomes more dynamic with respect to the ideological changes and technological advancements this isolated decision making approach and the associated individualistic handling of the different business functions will lead to local optimization of, rather than a more global optimization supply chain operations. Disadvantages resulting from non-integrated supply chains can include:

- Cost-overruns
- Lack of data sharing
- Internal competition
- Duplication of efforts
- Lack of vision

Management needs to take into consideration the dynamic nature of today's marketplace. This necessitates a more comprehensive (global) view of the activities that constitute the supply chain functions. An important foundational basis for a sound supply chain is the active cooperation between the partners with collaborative planning at each stage. Some of the driving forces behind an integrated approach to supply chain management include:

- Increased cost competitiveness
- Shorter product life cycles
- Faster product development cycles
- Globalization and customization of product offerings
- Higher overall quality

Among the more visible benefits of an integrated approach to supply chain management is the optimal control of inventory. As a result of the combined approach proposed herein, the optimization of various functions in a manufacturing environment, such as, location, production, and distribution, inventory can be maintained at more optimum levels leading to lower holding costs, reduction of required warehouse space, reduced material handling activities, and more timely deliveries. Another benefit is the reduction of transaction costs due to higher levels of information sharing and transparency required in an integrated environment. Real-time updates, reduced paperwork due to e-transactions, and reduced execution times, lead to lower transaction costs for each partner in the supply chain. Additional benefits may include the following:

- Function and procedural synergy between participants
- Lower response times to changing market conditions
- Reduced bottlenecks
- Decreased redundant activities
- Reduced manufacturing operations costs
- Reduced investment levels due to the elimination of redundant capacity
- Increased strategic competitiveness and positioning

Collaboration and collective decision making is key for effective planning within a supply chain. A holistic study of the interactions of the various supply chain functions is paramount to optimal supply chain performance. In other words, it is proposed that a simultaneous analytical treatment of this multi-echelon problem will lead to global optimization of the different business functions and, in turn, of the whole supply chain. In light of these observations, this research attempts to address the need for an integrated approach to supply chain management.

The organization of this manuscript is as follows. The next section presents a literature review of the previous work done in the field of supply chain optimization in general, and integrated analysis, in particular. Section three then presents the proposed integrated supply chain optimization model in detail. Section four applies the model to a sample problem and the conclusions and future research directions are delineated in section five.

## 2 - Literature review

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There is much literature available on supply chain management research. Additionally, numerous studies exist on the aforementioned four supply chain functions of location, production, inventory, and transportation. Furthermore, some new research exists specifically in the area of integrated supply chain optimization. Existing models include a combination of two or more of these areas for integration. This section presents a review of some of the work done to date in these areas.

One of the first steps needed to run an effective supply chain is the strategic positioning of the manufacturing facilities, warehouses, and distribution centers. Canel and Khumawala (1997) provide a review of the literature for the uncapacitated multi-period international facilities location problem (IFLP). They also formulated a mixed-integer programming (MIP) model and solve it using a branch and bound method. The decision variables include the countries in which to locate manufacturing facilities and their production and shipping levels. Computational time was also considered as another performance indicator. Canel and Khumawala (2001) developed a heuristic procedure for solving the MIP model of a similar IFLP. The heuristic procedure presented therein was also tested for computational efficiency. Lei, et al. (2006) considered the production, inventory, and routing problems simultaneously. They employed a two phase approach in an effort to solve an (admittedly) hard problem by first solving a restricted version of the problem.

A number of quantitative models use mixed-integer programming (MIP) to solve supply chain optimization problems. One of the arguably seminal attempts to do so was Geoffrion and Graves (1974) in which a MIP model was formulated for the multi-commodity location problem. Their research involved the determination of distribution center (DC) locations, their capacities, customer zones, and transportation flow patterns for all commodities. A solution to the location portion of the problem was presented, based on Bender's Decomposition (BD). The transportation portion of the problem was then decoupled into a separate classical transportation problem for each commodity. Their approach shows a high degree of effectiveness and advantage of using BD over traditional branch-and-bound. However, the computational requirements and technical resources required for its implementation make it a difficult choice.

Cohen and Lee (1988) developed an analytical model to establish a materials requirements policy based on stochastic demand. They presented four different models with a minimum-cost objective function. They then developed a mathematical solution algorithm to obtain optimal ordering policies for cost minimization. Cohen and Lee (1989) developed a deterministic analytical MIP model to maximize the global after-tax profits through optimal policies for facility network design and material flows. The decision variables for the network design issues included location and the capacities of all production facilities whereas those for material management issues included sourcing decisions, production, and distribution planning. The model finds the optimal resource deployment for a particular policy option. It thus showed the robustness of the global manufacturing network which provides the company with increased flexibility in responding to changing scenarios by adjusting the sourcing, production, and distribution plans.

Arntzen et al. (1995) developed a Global Supply Chain Model (GSCM) at Digital Equipment Corporation, wherein they developed a MIP that accounted for multiple products, facilities, echelons, time periods, and transportation modes. It is then solved using branch-and-bound enumeration. Kumanan et al. (2007) employed two novel search techniques in an effort to minimize total cost of production and distribution in a supply chain network. Camm et al. (1997) decomposed the supply chain problem at Proctor & Gamble into two sub-problems: a distribution-location problem and a product-sourcing problem. A combination of integer programming, network optimization models, and geographical information system (GIS) was then used to solve this problem. It shows the integration of the sub-models and highlights the importance of a combined approach to supply chain optimization.



An ingenious MIP model for a production, transportation, and distribution problem was developed by Pirkul and Jayaraman (1996) to represent a multi-product, tri-echelon, capacitated plant and warehouse location problem. Their model seeks to minimize the sum of fixed costs of operating the plants and warehouses as well as the variable costs of transporting multiple products from the plants to the warehouses and finally to the customers. A solution procedure is provided based on Lagrangian relaxation (LR) to find the lower bound, followed by a heuristic to solve the problem. Fumero and Vercellis (1991) also used LR to solve a MIP model for integrated multi-period optimization of production and logistics operations. Two approaches are presented – integrated and decoupled – and results are compared. The objective in their integrated approach was to minimize the inventory, setup, and logistics costs by employing LR which enables the separation of the production and logistics functions. In their decoupled approach, the production and logistics problems are analyzed and solved separately in two different models. The results from these two approaches are then compared to analyze their performance. Their analysis shows that for problems of greater sizes (number of products, customers, time periods), the integrated approach is preferable. Lagrangian relaxation was also utilized in a study by Min et al. (2004) in which the authors were able to decouple the forward and the reverse supply chain logistics problems.

Sabri and Beamon (2000) presented a multi-objective, multi-product, multi-echelon stochastic model that simultaneously addressed strategic and operational planning while taking into consideration the uncertainty in demand, production, and supply lead-times. Chandra and Fisher (1994) compare the computational aspects of solving the production and distribution problems separately and in a combined model. Dasci and Verter (2001) consider the integration of production and distribution functions by proposing an alternative approach based on the use of continuous approximation of costs and demands as opposed to discrete MIP models. Simultaneous, instead of sequential optimization of configuration decisions in production-distribution networks is proposed to avoid sub-optimality. Decision variables in the model are the number and locations of facilities as well as their service regions (i.e., a location-allocation model). Closed form solutions are obtained to minimize the fixed costs of facility location, operations, and the transportation costs. Dhaenens-Flipo and Finke (2001) consider an integrated production-distribution problem in a multi-facility, multi-product, and multi-period environment. The problem is modeled as a network flow problem with an objective to match products with production lines to minimize the related costs. The network has three elements – production lines, warehouses, and customers – and is initially modeled for a single period and then extended to obtain a multi-period model. The problems are randomly generated and solved using off-the-shelf optimization software.

Lodree, Jang, and Klein (2004) consider the integration of customer waiting time with the production-distribution functions in a supply chain. Optimization policies for models with combinations of production, inventory and transportation costs, along with customer waiting times have been proposed to determine the production rate and the sequence of vehicle shipments. Erenguc, Simpson, and Vakharia (1999) provide a review of the important decision elements in each of the three stages of the supply chain network – supplier, plant, and distribution. The supplier stage analysis deals with issues like supplier selection, number of suppliers, and the volumes of shipments from each of them. A multi-product, multi-stage inventory model is then formulated for the plant stage considering linear inventory holding costs, fixed costs for replenishment, and no capacity constraints. The distribution stage reviews in detail the important factors for issues such as distribution network design, location/allocation decisions, and inventory decisions.

The problem of simultaneous analysis of different supply chain functions has attracted many researchers and has produced a considerable amount of literature in this area. However, there are some unexplored areas that need to be addressed in the field of integrated supply chain optimization. This research represents an attempt in this direction along with suggesting a path for extrapolation of future research efforts needed to develop an integrated approach. As noted, a majority of the models presented so far have been concentrated mostly on the integration of two supply chain functions: location-production and production-distribution. Hence, the aim here is to develop an integrated model which, along with optimal capacitated facility location, also includes the optimization of the production and distribution functions as well as inventory flow in the supply chain. A capacitated facility location function in a multi-product,

multi-echelon production-distribution system with deterministic demands and linear transportation costs is considered here. The specific aim is thus to develop a quantitative model that represents an integrated capacitated-location/production/distribution (CLPD) problem. Analysis of each of these functions simultaneously in an integrated framework will help in better coordination of the supply chain.

### 3 - Supply chain integration model

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In this research we consider a multi-product, multi-facility, and multi-customer location-production-distribution system. The system contains a set of manufacturing facilities each with limited production capacities situated within a geographical area. Each of these facilities can produce any of the items in the company's line of products. The customer demands for the products are to be satisfied from this set of manufacturing facilities. There are fixed costs associated with each facility location which may include land costs, construction and fabrication costs, etc. We assume that customer allocation decisions for each manufacturing facility are based upon capacity related constraints. The production capacities of each of the facilities effectively represent their current plus potential capacities.

The input costs per unit for each facility represents the total cost of procuring all material needed for production of those items. This includes the purchasing costs as well as transportation costs for these inputs. Subsequently, the per unit manufacturing costs for production at each facility includes the setup costs, machining costs, assembly costs, and other related processing costs. The per unit input costs and per unit manufacturing costs for the same product may be different for each facility due to various factors such as location, proximity to the input sources, regional labor costs, transportation costs, taxes, government regulations, etc. These factors will therefore play a role in the selection of facilities (location) and to what extent each facility will satisfy the customer demand (allocation).

The customer locations and their distances from each of the facilities are also known. Hence, the transportation costs required to ship the products from the manufacturing facilities to the customers are also important for plant location and customer allocation. Furthermore, sometimes urgent orders need to be expedited which means transportation times are also an important metric in customer satisfaction.

The integrated model developed here is formulated as a mixed binary integer model which determines the strategic level location-allocation decisions. The model is an integration of the following functions:

- *Capacitated location*: This function deals with the capacitated location of the manufacturing facilities and the allocation of customer demands for these facilities. It considers the different constraints such as capacities, demands, and fixed and variable costs at each facility. This function helps in the optimal location of manufacturing facilities to satisfy customer requirements within the constraint framework.
- *Production*: The capacities of each of the manufacturing facilities and the customer demands act as the inputs to the production function which determines the production quantities of every item at each of the facilities.
- *Distribution*: The demand for each product from the customers and other parameters such as holding costs, fixed costs, and transportation costs determine the inventory control policies and the average inventory levels. This function receives inputs such as travel times, transportation costs, etc. to optimize the decisions as to the number of shipments, shipment schedules, and shipment sizes.

This research proposes a mixed binary integer programming (MBIP) approach for formulating the capacitated-location/production/distribution (CLPD) problem. The MBIP model is developed to represent the integrated problem and solved in the first phase using OPL® software which employs a Branch and Bound (BB) algorithm. The output from this model (and our unique contribution to the supply chain integration literature) is the optimal location of manufacturing facilities as well as the associated customer demand allocation to these facilities.

### 3.1 - Model development

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As noted, the problem is modeled as a mixed binary integer programming formulation that seeks to optimize capacitated facility location and customer allocation decisions, and production quantities at these locations to satisfy customer demands. The model uses available data to optimize the decisions with respect to location, production, and customer demand allocation.

### 3.2 - Assumptions

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The assumptions for our model are considered typical for a medium sized firm and are detailed below.

- Each manufacturing facility is able to produce all of the types of products. Admittedly, this assumption may require additional investment (transporting-resources-to or buying-resources-for a particular location).
- The selling price for a product may vary from customer to customer depending on the negotiations, order sizes, discounts, historical relationships, etc.
- Shipments of each product from each facility are in full truckload quantities and no truck carries mixed shipments. Less than truckload (LTL) shipment capability is left for future research and is documented as such in the conclusions section of this manuscript.

### 3.3 - Model formulation

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The parameters and the decision variables used to formulate the model are shown in Table 1 below.

Table 1: Parameters and decision variables for model

<b>Parameters</b>	
Skp	Selling price of product p for customer k
Fj	Fixed cost for plant location at site j
ujp	Total cost of inputs required for product p produced at plant j
mjp	Unit manufacturing cost for product p produced at plant j
rjk	Fixed cost for a shipment from plant j to customer k
tjk	Travel time per shipment from plant j to customer k
gjk	Transportation cost per unit time per shipment from plant j to customer k
Dkp	Total demand for product p from customer k
Wjp	Total plant capacity for product p at plant j
<b>Decision variables</b>	
xj	Binary variable to select a plant location at site j
Qjkp	Production quantity of product p for customer k at plant j

The formulation of the objective function and constraints is shown below.

$$\text{Maximize } \sum_{j=1}^J \sum_{k=1}^K \sum_{p=1}^P S_{kp} Q_{jkp} - \left( \sum_{j=1}^J \left( F_j x_j + \sum_{k=1}^K \sum_{p=1}^P \left( (u_{jp} + m_{jp}) Q_{jkp} + (r_{jk} + t_{jk} g_{jk}) \frac{Q_{jkp}}{e_p} \right) \right) \right)$$

$$\text{subject to } \sum_{j=1}^J \sum_{p=1}^P Q_{jkp} = \sum_{p=1}^P D_{kp} \quad \forall k \quad (1)$$

$$\sum_{j=1}^J \sum_{k=1}^K Q_{jkp} = \sum_{k=1}^K D_{kp} \quad \forall p \quad (2)$$

$$\sum_{j=1}^J Q_{jkp} = D_{kp} \quad \forall k, p \quad (3)$$

$$\sum_{k=1}^K Q_{jkp} \leq W_{jp} \quad \forall j, p \quad (4)$$

$$\sum_{k=1}^K \sum_{p=1}^P Q_{jkp} \leq Mx_j \quad \forall j \quad (5)$$

$$x_j \in \{0, 1\} \quad (6)$$

$$S_{kp}, Q_{jk}, W_{jp}, D_{kp} \geq 0 \quad \forall j, k, p \quad (7)$$

$$u_{jp}, m_{jp} \geq 0 \quad \forall j, p \quad (8)$$

$$r_{jk}, t_{jk}, g_{jk} \geq 0 \quad \forall j, k \quad (9)$$

$$e_p > 0 \quad \forall p \quad (10)$$

The model is formulated as a profit maximization problem. The objective function seeks to maximize the profit by subtracting total costs from the total revenues generated. Constraint (1) ensures that the total amount of products being manufactured at all plants for a particular customer is equal to the total demand of all products from that customer. Similarly, constraint (2) ensures that the total amount of a particular product being manufactured at all plants for all customers is equal to the total demand of that product from all customers. It is important to note here that the first two constraints are stated separately to show better accountability of the total demands from all customers and for all products respectively. Whereas the first two constraints consider the demands from all customers and for all products in terms of total quantities, constraint (3) considers the demand of each product from each customer individually. It thus ensures that the total amount of a specific product being manufactured for a particular customer at all plants is equal to the total demand of the product from that customer. Constraint (4) presents the capacity constraint. In other words, the total amount of a product being manufactured at a particular plant for all customers is less than or equal to the plant capacity for that particular product. Constraint (5) ensures that a plant is located if and only if there is a demand.

### 3.3.1 - Total revenues

The total revenues are obtained by multiplying the selling price of each product for each customer by its production quantity. As mentioned earlier the sales price for a product may vary from customer to customer. The following expression shows the total revenue function.

$$\sum_{j=1}^J \sum_{k=1}^K \sum_{p=1}^P S_{kp} Q_{jkp}$$

### 3.3.2 - Total costs

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The total costs required to satisfy demand for all products from all the customers is a combination of fixed costs, inputs costs, manufacturing costs, and transportation costs as is evident from the objective function. Each of these costs is explained in detail below.

#### 3.3.2.1 - Fixed costs

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Locating a facility at a site usually requires fixed costs such as land acquisition costs, facility construction costs, etc. For this model we assume that the locations of the manufacturing facilities locations will be selected from set of potential sites. These potential sites may or may not have an existing manufacturing facility at the site. Furthermore, if a facility exists at a potential site it may not have sufficient capacity to meet the demand requirements. For the first of these two cases, a new facility will need to be built from the ground up. For the latter, the existing facility may need expansion to meet the projected demands at that site. In this model, the costs related to these construction/expansion activities are considered to be fixed costs. It is assumed here that these fixed costs ( $F_j$ ) for each potential site  $j$  are known beforehand based on the current capacity and projected demand. Hence, the fixed costs for a potential site will only incur if the facility is ultimately located there. The binary variable  $x_j$  takes a value of one or zero, depending on whether the facility is located at site  $j$  or not. The fixed cost component of the objective function is shown below.

$$\text{Fixed costs} \sum_{j=1}^J F_j x_j$$

#### 3.3.2.2 - Input costs

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In a mass production environment, usually multiple inputs are required to produce a single product. Each of these inputs may be obtained from multiple sources with varying prices. The purchasing function looks into the aspect of purchasing all the inputs at the best available price in the market. The model presented here considers that the input sources have already been selected and the prices are already known. Also, there may be transportation costs for procuring these inputs from the suppliers. These input costs ( $u_{jp}$ ) for product  $p$  considered here include the purchasing costs ( $pc_{jp}$ ) of all the inputs required for product  $p$  as well as the transportation costs ( $sc_{jp}$ ) to procure them, as shown below.

$$\text{Input costs } u_{jp} = pc_{jp} + sc_{jp}$$

Although the same inputs are required to produce a product at any plant, the costs required to obtain those inputs may vary for different plants depending on the location of the plant, its distance from the input sources, market rates in that area, etc.

#### 3.3.2.3 - Manufacturing costs

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After the inputs have been purchased and transported to the manufacturing facility, different manufacturing operations are carried out to transform the inputs into finished goods. The manufacturing costs in the model are shown below.

$$\text{Manufacturing costs} = m_{jp}$$

As in the case of input costs, the manufacturing costs for the same product also may vary for different plants. This is because these costs depend on factors such as labor rates, overheads, etc. which may vary significantly for each plant.

### 3.3.2.4 - Transportation costs

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In this model we assume that finished goods are transported from the manufacturing facility to the customer's warehouse or the customer's manufacturing facility for further use. Additionally, these products are transported in truckloads at regular intervals. There is a fixed cost ( $r_{jk}$ ) for every shipment which is incurred per shipment. Depending on the plant-customer allocation pairs, the travel times ( $t_{jk}$ ) may vary according to the distances. It is assumed that the travel time is linearly proportional to the distance between the plant and the customer. However, the transportation costs may or may not be exactly proportional to the travel times because the transportation costs per unit time per shipment ( $g_{jk}$ ) may vary for each plant-customer pair depending on the route conditions, climate conditions, geographical factors, etc. The transportation cost component of the objective function is shown below.

$$\frac{\text{Transportation costs per unit time}}{\text{shipment}} = g_{jk}$$

For every product,  $e_p$  represents the maximum number of units of product  $p$  that can be shipped on every shipment. This quantity may vary for each product depending on the size, weight, or other special handling requirements for each product. The total transportation cost is thus given by the addition of fixed costs and variable costs for every shipment. The quantity ( $Q_{jkp}/e_p$ ) represents a uniform benchmark to compare the transportation costs for each plant-customer pair for every product.

### 3.3.3 - Capacities and demands

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Out of the existing set of potential sites for setting up a manufacturing facility, a majority is assumed to be sites already having an existing facility with a current capacity to produce a set of products, although some of them may be "green-field" locations with no existing facility at the site. The capacity of an existing facility, in turn, may not be sufficient to satisfy the customer demands which would entail expanding the capacities. The capacities for a plant refer to those for multiple products as each plant may contain several production lines for each of the products. Expansion of facilities, in some cases, would mean adding extra productions lines for products with high demands. Depending on various constraints, demand for a particular product from a single customer may be satisfied from multiple manufacturing facilities.

### 3.3.4 - Output

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As stated earlier, the output of the model formulated above is the location of the manufacturing facilities and the allocation of customer demands to each of these facilities. In other words, the output is obtained in the form of values for the following decision variables:

1.  $x_j$ : Plant locations
2.  $Q_{jkp}$ : Production quantity of product  $p$  for customer  $k$  at plant  $j$

The facilities are chosen from the given set of potential sites for which the capacities, fixed costs, input and manufacturing costs, and transportation costs are all known a priori. The customer demands are also assumed known. These customer demands are satisfied from the capacities of the located facilities. This model provides a general optimization of the CLPD problem on a broader scale thus representing higher level decisions in the decision hierarchy. It takes into consideration an overall account of the various constraints to suggest a solution that is optimal from a long-term perspective. The decision to locate a facility at a particular site has a strategic impact on the system thus influencing its performance over a greater time horizon.

## 4 - Implementation

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The model has been tested using OPL Studio 3.7. Five example problems have been solved each with different configurations. A summary of the results obtained are shown in Table 2 below.

Table 2: Summarized results of the five example problems

Problem size: Locations (L) – Customers (C) – Products (P)	No. of constraints	No. of variables	No. of iterations	Solving time (sec)	Plants located
3L-2C-3P	23	21	30	0,01	3
5L-2C-3P	31	35	91	0,02	4
15L-10C-10P	285	1515	494	0,22	11
30L-20C-15P	815	9030	1581	1,86	23
100L-80C-60P	11040	480100	17522	284,56	78

The solution for the second example problem, 5L-2C-3P is shown below in Table 3. The results indicate that plants 1, 2, 3, and 5 should be located to satisfy customer demands. The quantity of each product to be produced at each location for each of the two customers is detailed in Table 3 below.

Table 3: Detailed results for example problem 5L-2C-3P

	Quantity 1	Product	Quantity 2	Product	Quantity 3	Product
<b>Location 1</b>	Customer 1	= 1300	Customer 1	= 1200	Customer 1	= 1300
	Customer 2	= 0	Customer 2	= 0	Customer 2	= 0
<b>Location 2</b>	Customer 1	= 0	Customer 1	= 300	Customer 1	= 0
	Customer 2	= 1200	Customer 2	= 1500	Customer 2	= 2000
<b>Location 3</b>	Customer 1	= 0	Customer 1	= 1000	Customer 1	= 0
	Customer 2	= 500	Customer 2	= 0	Customer 2	= 700
<b>Location 4</b>	Customer 1	= 0	Customer 1	= 0	Customer 1	= 0
	Customer 2	= 0	Customer 2	= 0	Customer 2	= 0
<b>Location 5</b>	Customer 1	= 400	Customer 1	= 1000	Customer 1	= 900
	Customer 2	= 600	Customer 2	= 0	Customer 2	= 100

This table is now depicted in the bipartite graph shown in Figure1 below. The nodes on the left hand side of the bipartite graph show the potential locations one through five, the arcs represent the customers that are served by each location, and the products are on the right hand side. The degree of node L4 is zero. Hence, it is not opened to serve customers in this scenario.

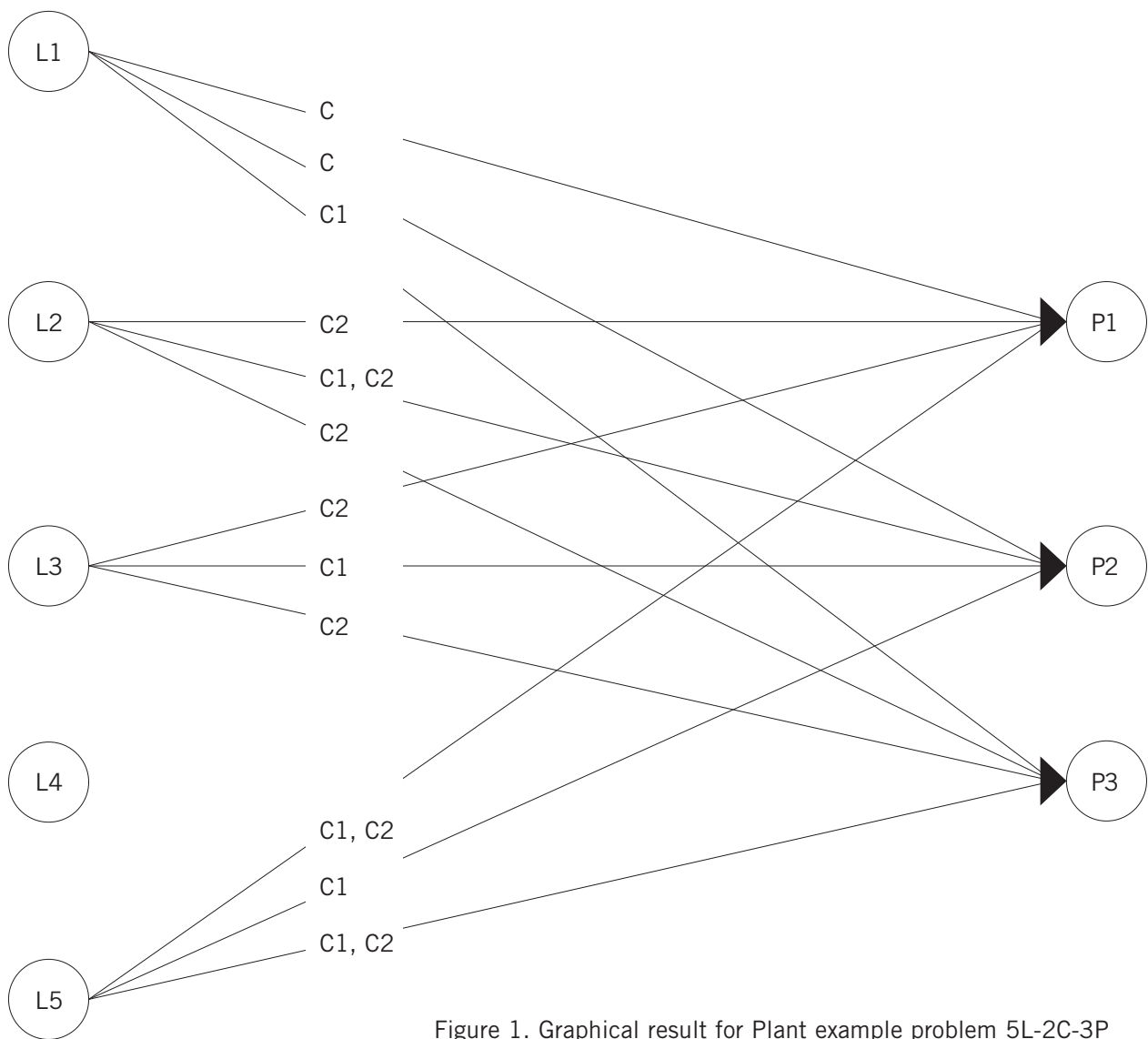


Figure 1. Graphical result for Plant example problem 5L-2C-3P

The solutions of the other three example problems in Table 2 were found in a similar manner. The fifth and largest problem tested, 100L-80C-60P, had more than eleven thousand constraints, almost one half million variables, and was solved to optimality in less than five minutes. This shows the robustness as well as the validity of the model for large-scale problems which could be faced in real-life applications requiring a quick but reliable solution.

The result for management is a robust solution technique, encompassing a broad set of input parameters, scaleable to a wide range of particular needs. Indeed, even with a very large problem (tens of thousands of constraints and millions of variables) solutions were deemed attainable in a reasonable (i.e., hours) amount of time.



## 5 - Conclusions and future research

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The model presented here integrates the capacitated location, production, and distribution functions in a single quantitative model. It thus achieves the goal of simultaneous, instead of sequential, optimization of supply chain functions. Analysis of solutions for large sized problems using this model shows a reasonable performance on solution time. This research presents a model allowing decision makers to simultaneously optimize the location, customer allocations, and product allocation decisions within a multi-plant, supply chain system. This is an extension of existing literature and useful for academics and practitioners alike. Future research can be directed towards considering stochastic instead of deterministic demand. This will help in considering a more realistic picture in situations where there is a lot of uncertainty in the market. Another area of future research is to evaluate routing decisions within this quantitative model. This could be done along with consideration of TL as well as LTL quantities as compared to just TL quantities considered here. Inventory management is also an important SCM function which could be introduced in the formulation to present a more comprehensive solution for the integrated model.

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