Marshall‘s Dilemma: Intangible Assets and European Universities

“INTANGIBLE ASSETS AND REGIONAL ECONOMIC GROWTH”

(IAREG)

Marshall‘s Dilemma: Intangible Assets and European Universities

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- To develop new indicators for improving the measuring of the IA considered having the most influence in the generation of economic development.
- To analyse how IA and their interaction define the environment affecting firms’ location.
- To measure the role of regional externalities in the generation of IA and in determining local economic performances in Europe and in the diffusion of knowledge.
- To provide decision makers with policy recommendations in order to support them in the future design and implementation of regional innovation strategies.

Research programme

The IAREG Project is organized in eight Work-packages, six of them being technical as follows:

Work-package	Objectives
WP 1 KNOWLEDGE ACCUMULATION PROCESSES AND REGIONAL GROWTH	The general objective is to achieve an integrated analytical framework of competitive strategies and collaborative linkages among firms and different organizations, in order to improve the understanding of the systemic nature of innovation processes at the sub-national and national scale; and to derive policy implications for national and regional systems of innovation
WP 2 HUMAN AND SOCIAL CAPITAL AND REGIONAL PRODUCTIVITY	The main objective of this work-package is to analyze the influence of human and social capital on economic growth not only directly but also including the interactions among both of them, an issue that has not been studied in depth in the literature. Therefore, both individual and regional/national returns to human and social capital will be analysed as interacting factors of economic development in Europe.
WP3 ENTREPRENEURSHIP CAPITAL AND REGIONAL COMPETITIVENESS	The main objective of the work-package is to provide evidence on the impact of entrepreneurship capital on regional competitiveness and economic growth.
WP4 KNOWLEDGE FLOWS AND REGIONAL PRODUCTIVITY	The aim of this work-package is to better understand why the IA analyzed in the first block (WP1, 2 and 3) impact on firm and regional growth.
WP 5 IA, FIRMS LOCATION AND REGIONAL COMPETITIVENESS	The main objective is to estimate the role of the different types of IA in determining local economic performances in Europe, focusing on the impact they have on the localization choice of firms.
WP6 POLICY DESIGN TO STIMULATE IA AND ECONOMIC GROWTH	The main objective is the collection of policy conclusions according to conclusions extracted from WP1 to WP5.

Lisbon Objectives and Intangible Assets

-“[T]he small band of British scientific men have made revolutionary discoveries in science; but yet the chief fruits of their work have been reaped by businesses in Germany, where ***industry and science have been in close touch with one another*** (Marshall 1923, 101-2, fn 1).

-To overcome modern „European Paradox“--in which industry commercialises science poorly—the Lisbon Objectives of 2000 now promote discovery and commercial conversion of Intangible Assets (**IA**) to attain growth and development goals throughout Europe.

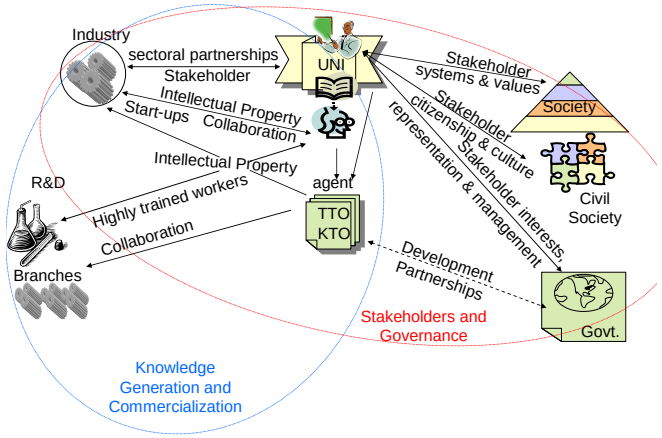
-**IA** includes: intellectual property components (licenses, patents, copyrights, trademarks, etc.) and the more subtle intangible capacities embedded in strategic, differentiating competencies not easily converted to property or reduced to specific elements.

-Beneficial effects of **IA** visible at many levels, *principally the regional level*, as innovations systems, localized clusters, and productivity growth where one readily senses Marshall’s famous dicta of “skills in the air”.

Stakeholders unlocking EU University IA

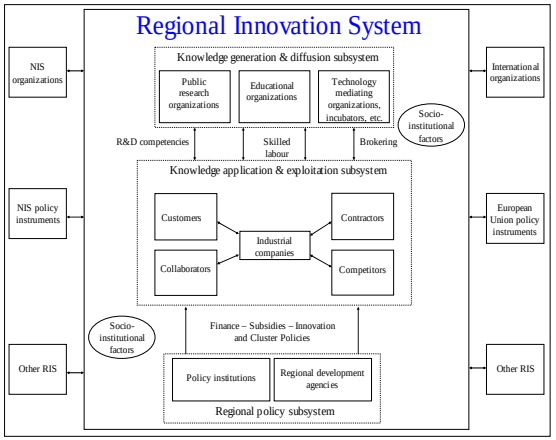
- Efforts underway to *bring science and industry closer together in Europe*, particularly prospects for reaping the latent intangible assets locked away in university scientific systems and practices.
- Major changes in EU university harmonisation and governance are *also* underway: national university systems granting greater autonomy, budgetary discretion, and a general shift from regulation- to performance-based management practices.
- The decentralization of authority and policy-making is shifting oversight generally *from* ministerial and parliamentary *to* external bodies (e.g., EU-wide accreditation groups) and greater stakeholder oversight, including *local governments, civil society and the economy*.
- "Higher education of an increasing proportion of the rising generation is playing a role in the democratisation of society, in promoting social mobility and social justice and…"setting up students for the act of self discovery". They play vital roles in national and international civic society, where they must "speak truth to power".

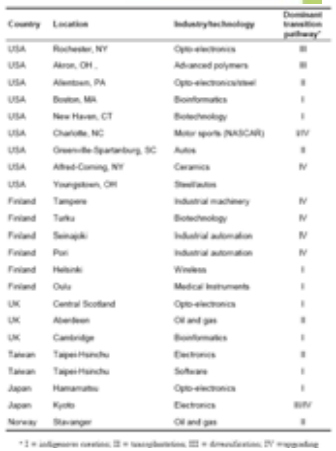
Governance, Stakeholders and Commercial Conversion



Universities can be seen as a one element of regional institutional systems which are struggling to adapt to the needs of a global process of competition for investment and jobs. The importance of the universities comes from their role in the knowledge generation and transfer process which underpins the success of regions in attracting and retaining high value added activities, in the form of mobile capital and talent (Florida, 2005), or through processes of endogenous development. Cultures of learning, association and institutional adaptation are both supported by the work of universities, but also themselves shape the extent to which universities can be beneficial to their regions

Charles, 2006

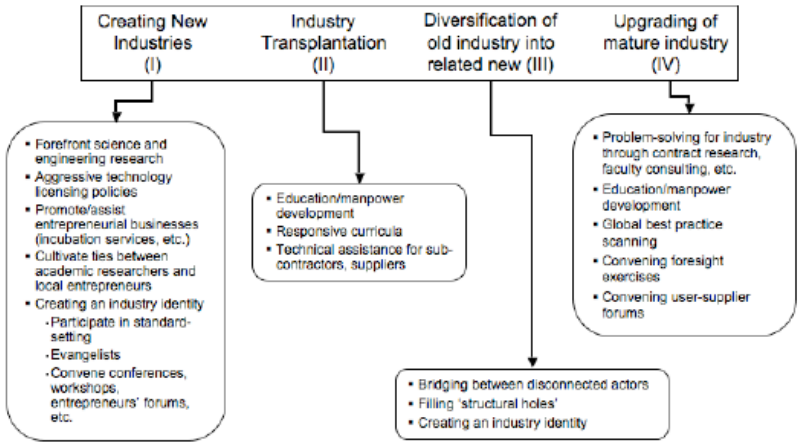




Country	Location	Industry/technology	Dominant transition pathway*
USA	Rochester, NY	Opto-electronics	III
USA	Akron, OH.,	Advanced polymers	III
USA	Allentown, PA	Opto-electronics/steel	II
USA	Boston, MA	Bioinformatics	I
USA	New Haven, CT	Biotechnology	I
USA	Charlotte, NC	Motor sports (NASCAR)	I/IV
USA	Greenville-Spartanburg, SC	Autos	II
USA	Alfred-Corning, NY	Ceramics	IV
USA	Youngstown, OH	Steel/autos	
Finland	Tampere	Industrial machinery	IV
Finland	Turku	Biotechnology	IV
Finland	Seinajoki	Industrial automation	IV
Finland	Pori	Industrial automation	IV
Finland	Helsinki	Wireless	I
Finland	Oulu	Medical instruments	I
UK	Central Scotland	Opto-electronics	I
UK	Aberdeen	Oil and gas	II
UK	Cambridge	Bioinformatics	I
Taiwan	Taipei-Hsinchu	Electronics	II
Taiwan	Taipei-Hsinchu	Software	I
Japan	Hamamatsu	Opto-electronics	I
Japan	Kyoto	Electronics	II/IV
Norway	Stavanger	Oil and gas	II

*I = endogenous creation; II = transplantation; III = diversification; IV = upgrading

University roles in alternative regional innovation-led growth pathways



Lester, 2005

How do universities contribute to regional innovation and development?

1. **Universities have multiple ways to contribute to local innovation processes directly.** The possibilities are not limited to patenting and licensing discoveries made in university laboratories. In addition to their own discoveries, universities can help to attract new knowledge resources from elsewhere. They can help to adapt knowledge originating elsewhere to local conditions. They can help to integrate previously separate areas of technological activity in the region. They can help to unlock and redirect knowledge that is already present in the region but not being put to productive use. Most of these university contributions presuppose the presence of local industry.

2. **In most cases, the indirect support provided by universities for local innovation processes is likely to be more important than their direct contributions to local industry problem solving.** The most important of these indirect contributions is education. But a university can also play an important role as a public space for ongoing conversations, involving local industry practitioners, about the future direction of technologies, markets and local industrial development. This public space can take many forms, including meetings, conferences, industrial liaison programs, standards forums, entrepreneur/investor forums, visiting committee discussions of departmental curricula, and so on. The conversations between university and industry people that occur in these spaces are rarely about solving specific technical or commercial problems. But they often generate ideas that later become the focus of problem-solving both in industry and in universities. The importance of the public space role of the university and its contribution to local innovation performance is frequently underestimated.

3. **The conditions, practices, and attitudes that lead to successful technology take-up and application in local industries depend on the specific characteristics of the industry and its development pathway.** Our studies make clear that industry upgrading, industry diversification, industry importation, and industry creation are each associated with different local patterns of technology take-up and application. More specifically, for each type of transition we observed a distinct pattern of university participation in the local innovation system.

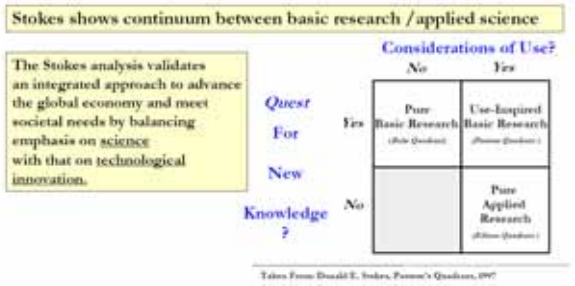
4. **Universities should approach their role in local innovation processes strategically.** This means developing an understanding of the particular circumstances and needs of local industries and the strengths and weaknesses of their own institutions, and it means seeking a fit between local industry needs and internal university capabilities. Universities should discard the one-size-fits-all approach to technology transfer in favor of a more comprehensive, more differentiated view of the university's role in local economic development.

5. **A strategic approach to the local economic development role is compatible with the pursuit of excellence in the university's traditional primary missions in education and research.** Indeed, success in these primary missions is a necessary condition for contributing effectively to innovation and growth in the local economy. The fear that these missions will somehow be harmed is not a good reason for universities not to embrace their role in local innovation processes.

Lester, 2005

Key Governance Issues

- Provide supplemental funds to a *subset* of research universities, along with greater budgetary and administrative autonomy, to leverage such funding effectively (Aghion, et al)
- EU university "profesional managers" now challenging ministerial oversight and showing appetite for expanded discretion, including selection and pursuit of specific university mission (CHEPS).
- LERU argues university's mission should focus upon the most realistic research orientation (e.g., "MIT Pathways" and "Stokes-quadrants")



Research and Commercialization Policies Gradually Emerge (CHEPS)

- Among EU universities, 27% have had for at least 3 years incentive policies to ***reward research performance***, while 20% have recently developed policies, 21% in development phase, and 26% have made no effort.
- Among EU universities, 22% have had policies for at least 3 years to ***promote the commercialization of research discoveries***, while 18% have recently developed policies, 24% in development phase, and 29% have made no effort.
- Among EU universities, 52% believe their university's ***internal governance procedures have stimulated increased entrepreneurialism.***
- Establishing an *official university agent* to bridge/broker science and industry interactions is a common response (TTOs, KTOs).

University-Industry Bridging Agents: Mixed Record

Invention disclosures, priority patent applications, and options and licenses reported to AUTM (U.S. research universities) are several orders of magnitude higher than European ProTon (**KTO**) equivalents, which indicate considerable potential still awaiting realization.

Table 1. PAS 2005 fact-sheet

Overall Figures	FY2004	FY2005			US-AUTM
	Absolute	Absolute	Per KTO	Per M€	Absolute
Survey respondents (#)	172	392			228
Number of PRO served	246	421			228
Invention disclosures (#)	3016	4570	14.8	0.9	27,382
Priority patent applications (#)	1367	2310	6.6	0.3	10,272
Options and licences (#)	680	731	2.8	0.1	4,932
Licence Income (M€)	70	94	0.3	0.04	1,229
Collaborative and contrac. R&D (#)	13,813	63,018	236	42.5	n.a.
Collaborative and contrac. R&D (M€)	734	2,884	10.1	0.2	2,961*
# Spin-off	176	434	1.3	0.1	628
KTO professional staff	7.7	6.07	6.07	0.43	3.7
KTO budget (k€)	612.1	333.3	333.3	0.021	
KTO age (years)	10	8.6			

*Not managed by US-AUTM technology transfer offices

TTO Practices Compared

The AUTM institutions are more efficient in producing invention disclosures, filing patent applications and in receiving patent grants than the European ASTP institutions. For example, the AUTM respondents require 13 million PPP$ to produce one patent grant, whereas the ASTP respondents require 16.7 million PPP$ per patent grant. Conversely, European ASTP members require a smaller amount of research expenditures to produce one license agreement and one start up than the AUTM institutions. These results suggest that the AUTM institutions are more effective in patenting, particularly for patent applications, but that the ASTP members are more effective in establishing start-ups.

-The number of licenses increases with **TTO** staff size and PhD shares of staff, the number of invention disclosures, being engaged in bio-medicine, and quality of university (as proxied by *Science* and *Nature* articles). Unexpected were fewer licenses concluded among older, more experienced TTOs, while privately-managed TTOs were expected—but unable—to show positive influence. (Conti, Gaule, Foray, 2007)

- Four out of five researchers who commercialized research at a Swedish university did not know the types of support the TTO offered. (Braunerhjelm, 2006)

Issues with University-Industry Bridging Agents

-University commercialization practices may reflect inappropriate objectives and supporting policies, e.g. revenue maximization (patents, licensing) vs. local economic development (faculty startups, rates of which may be grossly underestimated)*~.

-Royalty distribution formulae should be revised to favour faculty members and incentive compensation is considered best for technology licensing officers*.

-Universities that wish to pursue patent or licensing agreements should supply additional support staff tasked to help file invention disclosures or to support the necessary paperwork or unproductive procedures (*time per patent=8 peer reviewed publications!*)*

-At institutions where TTOs are considered helpful, the likelihood that scientists will *license their patents rises*, while the likelihood *falls for scientists pursuing entrepreneurial options*.~

- Scientists in institutions that must deal with TTOs perceived to be unhelpful are more likely to become entrepreneurs.~

*Phan and Siegel (2006), ~ Audretsch, et. al. (2006)

Unwrapping Marshall's Dilemma: Firm and University Layers

-University „bridging agents" probably undercount the total number of university-industry interactions and may mis-specify their character reported in typical types of aggregate data.

-Greater insight may be gained from querying directly universities and firms, each describing the nature of valued interactions, in which places or types of institution interaction occurs, and examining factors responsible for degrees and types of interaction.

-University-Firm interaction literatures:

Firm Views of Interactions with Universities: A Comparison

Studies→ / Innovation Issues	MIT Study (Lester, et al, 2007)	CIS Studies (Laurson & Salter, 2004; Arvanitis, et al, 2005)	Cosh, Hughes, Lester, 2006	Broström and Lööf, 2006	Arvanitis, et al, 2005	Schartinger, et al, 2001
Principal Interaction(s)	New industry creation; industry transplants; diversify old to new; upgrade mature	Importance of *university research* to firms	Open Science (*publications, conferences, graduates*) most important; *not* intellectual property	Collaborate to *observe progress on emerging scientific front*, ensure *flow of skilled workers*	"Tacit" forms of generic interaction, i.e. *informal contact, publications, staff hiring and training*	*Highly skilled personnel* is main interest (lesser interest in consultation or development services by largest firms)
Principal Factors	Interactions depend strongly upon needs of diverse regions and firms	**R&D-intensive**, large firms, firms in **specific industries**	Small UK firms rely far less than U.S. SMEs on university inputs	Unclear what interactions first attracted firms to interact w/universities	H.C./**R&D intensities**, **high-tech mfg.**, older firms	Large or **R&D-intensive** firms; young firms also interact for **product devt.**
Constraints or Qualifications	**Universities may have not yet adjusted;** firms may not detect advantages	Absorptive capacities and BERD differ widely	**Weaker tradition of UK firms to work w/universities,** particularly SMEs	Firms sense that **universities not interested in collaboration**	Codified knowledge sought by firms developing new products.	Firms lack info about university research and also **perceive cultural gaps**
Agents Queried	EU and U.S. firms	EU firms	UK and U.S. firms	Swedish firms that interact w/universities	Swiss firms	Austrian firms with new products

University Views of Interactions with Firms: A Comparison

Study→ Innovation Issues	Shartinger, et al, 2001	Arvinitis, et al 2005 (I) *Action*	(II) *Output*	D Éste and Patel, 2007	Goktepe, 2006	Braunerhjelm 2007	2006
Principal Interaction(s)	Supervision of theses, mobility, **contract** and **joint research**	"KTT" composite of informal (workshops, etc.), **labs,** training, **research,** and consultation	Considered separately: Patenting from large or hospitable units. **Spinoffs** from unit scale and high teaching loads. **Licensing** *only* in Swiss federal research institutes. All were reduced by several defined obstacles.	Meetings & conferences, consultancies, **contract research, labs,** training, **joint research.** Types and Frequency.	EPO patents held	Researcher experience with commercialization of research findings and discoveries	
Principal Factors	Natural science depts., prior **business** or public research, international publications	Prior business research, # PhDs, basic:applied science ratio, natural/physical science units		Co-authored publications, prior EPSRC grants, status as professor, and **youth** increased contact types and frequencies	Electronics, chemistry, and medicine dominate, **45-50 y.o.** staff most productive; Full 40%, Assoc/Phd 20%, post-docs, part-time or adjuncts 40%	17% had some experience (e.g. spinoffs); TTO unknown to 80% with some experience; inexperienced 44% think their research has prospects	Commercial'z unaffected by University's "Youth", but private-funded research effect; TTO does not clarify role or support to 80% of researchers
Constraints or Qualifications	**Public engagement** of department staff cut interactions with business	**Teaching loads** and selected obstacles reduced KTT	**Teaching loads** constrained all but spinoffs, *which gained*; licenses weaker in mid-size economics & medicine insts.	More types in **former Polytechnics** while weak RAE ratings affect applied science researchers	Staff frequency highly skewed; **377 by firms** (67 SMEs, 80 spinoffs, 210 large), **98 by individuals**, **19 TTO**	Researchers who do not pursue "proprietary" commercial'zne require little help	Potentially very large stock of unexploited research untouched by TTO efforts
Agents Queried	All Austrian university departments	All Swiss academic and scientific institutes		Researchers w/ funds from UK Eng. & Physical Sci. Res. Council 1995-2003	Academic staff at Lund university holding EPO patents 1990-2004	Linköping University tech/med researchers	Linköping, Umea, Lund, Uppsala researchers

Some Provisional Comments

Firms probably have multiple, regionally-specific interests when collaborating with universities, but the largest, most R&D intensive firms appear simply to want the „public goods" effect from published research, trained graduates, conferences, workshops, training, etc.

Firms also wary of incompatibilities, gaps, wasted time. Particularly true for SMEs in EU, even though their interests most likely to be advanced.

Universities unsure of what commercial contacts to pursue, how to do it well (TTOs? Stimulate faculty research?).

How to organize the ongoing academic enterprise to exploit commercial possibilities without endangering core functions is a major concern, despite Lester's optimism.

Major trade-offs for universities and faculty members among academic roles when pursuing commercial prospects; trade-offs strongest for teaching and public service, but also research (8:1) when patenting.

„Matthew Effects" in research and related activities may require attention.

Important that universities maintain strong „public goods" focus, which also presents opportunities to build commercialization out from existing firm interests. „Pin factory" equivalent visits possible.

Missing Stakeholders

Broad findings to date stress interactions between institutions, not individuals

Creative work done by *individual* scientists, innovators or entrepeneurs

Differing incentive structures, but general indifference to brokers/bridging

Faculty researcher motivations and interests insufficiently explored

Need to investigate more fully the views of active faculty members as key academic stakeholders, possible innovators and potential entrepreneurs

Next Steps

A major survey of the directors of departments and institutes concerned with *six distinct disciplines* offered in European universities will be conducted to investigate researcher motivations and interests.

Are faculty members actually *increasing* their research involvement? Moreover, what types of incentives or other considerations might be important factors in such decisions?

What additional types of incentives or measures would faculty find acceptable in their universities and which not? Is commercialization seen compatible with research, teaching and public service demands?

Would faculty gravitate toward or away from universities that pursue enhanced research and commercialization policies?

How do such views compare with counterparts in the U.S. and Australia?

Are views concerning commercialization spread uniformly over national university systems, across heterogeneous disciplines, among faculty members of various ages, types of experience and views of university mission?

My name was listed as an author on the following *total* number of peer-reviewed journal articles and *scholarly books or book chapters published during the past 2 academic years*:

0
1-2
3-5
6-10
>10

During the *past 2 academic years*, I have personally taught the following *total* number of *university-level, semester-length courses*:

I do not teach
1-2 university-level courses
3-5 university-level courses
6-10 university-level courses
10+ university-level courses

Do you personally have frequent *contacts with external stakeholders* (firms, governments, NGOs, or other non-academic organizations) that benefit directly from your academic expertise since 2003? Yes

Which types of activities entail direct external stakeholder contact at least four times per year?

-Member of board or commission, appointed advisor, other non-academic office
-*Uncompensated* consultations to professional, scientific, governmental, cultural, private organizations.
-Participate in non-academic conferences, symposia, congresses, seminars, workshops
-Informal meetings, discussions, popular communications or articles
-Non-academic demonstrations of university research findings or methods
-Continuing education of industry staff/public officials
-Public presentations and lectures of general topics
-Other activities with stakeholders_____

Have you ever investigated opportunities to commercialize the results of your research findings or academic skills in ways that could potentially increase your overall income? Yes

Please indicate on the following list all approaches that you have used in the last 5 years:

-Consulted with staff of our university's intellectual property or technology transfer offices to investigate possibilities
-Launched a new firm based on my academic expertise outside the university
-Launched a fee-based service or institute *within* my university
-Sought to license some scientific procedure, discovery or method
-Applied for National, European or US patents
-Fee-based personal consultation with external clients
-Joined corporate board of directors as compensated member
-Contractual supplier of research services to firms and organizations
-Developed commercial book, publishing, or media contracts
-Transferred intellectual property rights to one or more established enterprises in which I acquired a proprietary interest
-Other commercial approaches (indicate which)

Have you ever investigated opportunities to commercialize the results of your research findings or academic skills in ways that could potentially increase your overall income? No

What is the single, most important reason you have *not* sought to commercialize research?

-my research lacks commercial possibilities
-my university obligations do not permit sufficient time to consider possibilities
-I lack the knowledge of how to commercialize possibilities
-my university does not encourage (or it discourages) faculty commercialization of research
-there are no or few private opportunities to commercialize in my local region
-my research is dedicated solely to advancing the core scholarship or science base of my discipline
-One other important reason not to commercialize research? _____

The average annual income you receive from all active academic commercialization efforts is:

none
much less than your university salary
somewhat less than your university salary
about same as university your salary
somewhat more than your university salary
much more than your university salary

Looking forward from the 2005-2008 period, how intensively do you intend to pursue commercialization activities in the next 3 years?

Less intensity Same intensity More intensity